Enclosure I

washington river protection solutions | PO Box 850
Richland, WA 99352

June 8, 2009 WRPS-0900932

Mr. Glen Triner, Manager
M&EC Waste Support Services
P. O. Box 1600
MO-281/110/200W/T4-09
Richland, WA 99354

Dear Mr. Triner:

REGARDING WASTE PROFILE WRPS-270-0001, *RH MIXED TRU WASTE*

This letter is to request an exception to the HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria,* Appendix I.

WRPS removed the C104 Heel Jet Pump that has initially characterized as RH TRU waste. This pump is approximately 34 feet in length and has a contact dose reading on the outside of the basic packaging ranging from < 50mr/hr to 780 mr/hr. The lower portion of the pump is in a metal pipe sleeve with lead blankets and the upper portion has no lead shielding, but is packaged in a PVC "Coffin". The pump meets the WIR determination ESQ-EM-IP-M435.1-1-01 and can be disposed as radioactive waste.

This waste was not forecasted as RH TRU. In the SWIFT forecast it was anticipated to be LLW and would be able to be disposed at ERDF. The life cycle planning for this waste did not anticipate the waste would characterize as TRU waste. Since the dose to curie calculations have such a wide variance, WRPS has contracted PNNL to perform NDA on this equipment to develop more precise characterization. Should this process characterize this equipment as low level waste rather than TRU, the waste will be shipped directly to ERDF for disposal.

Because of the nature of the pump and the dose, WRPS does not have a facility that can size-reduce this pump and package it to meet the WIPP criteria. We have contacted the PermaFix Northwest (PHNW) facility to determine if they would accept a modification to our existing contract to perform size reduction and packaging in WIPP compliant packaging. We are requesting acceptance of the 34 foot pump in an IP-1 container for storage until such time that a contractor who can accept this waste for repackaging can be located or, if that is not possible, until the Hanford Site has a repackaging facility to accommodate this waste. The waste will be packaged for transport and storage so that the exterior dose of the package does not exceed 200 mr/hr.

The waste profile has been submitted to M&EC for approval. The 90-day clock for this waste expires on July 8, 2008.

Please consider this request for an exception to the Hanford Site Solid Waste Acceptance Criteria. Additional information is attached.

Sincerely,

Judith A. Nielsen

Judith A. Nielsen, Manager
Site Services and Tank Sampling
Washington River Protection Solutions LLC

Attachment

JAN:GKS

cc: Amanda Ramirez, M&EC Waste Support Services, Technical Services Manager
Ron Koll, ORP
Mike Royack, ORP
Chris Kemp, ORP
WRPS Correspondence Control

ATTACHMENT

C104 Heel Jet Pump – 34 feet long, 12-30 inches diameter

TRU Waste – Based on TWINS BBI calculates as RH TRU

Characterization – Dose as packaged (not shipping container) <50 – 780 mr/hr. Characterization is included in the waste profile.

Packaging

Inner Packaging – Double plastic wrap, lead lined pipe and PVC hinged cover (top 10')
Outer Packaging – DOT IP-1 container (40' conex)

Cost Analysis

Based on posted rates and charge by container volume, not waste volume.
This does not include future treatment cost if packaged in the future at Hanford.

60 Foot Box (plus replace box at $600K)			**Conex 8x8x40**		
CWC	PFNW	CWC Temp	CWC	PFNW	CWC Temp
$214K	$643	?+ $643	$364K	$1090	? + 1090

washington river protection solutions | PO Box 850
Richland, WA 99352

WRPS-1001077
REISSUE

Mr. Glen Triner, Manager
M&EC Waste Support Services
P. O. Box 1600
MO-281/110/200W/T4-09
Richland, WA 99354

Dear Mr. Triner:

REGARDING WASTE PROFILE WRPS-270-0001, *RH MIXED TRU WASTE*

This letter is to request an exception to the HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria,* Appendix I.

WRPS removed the C111 Saltwell Screen on April 1, 2010 and final characterization indicates the waste as remote-handled (RH) TRU. This screen is approximately 11" diameter and 35 feet in length and has a contact dose reading on the outside of the basic packaging ranging from 9 mr/hr to 18000 mr/hr. The lower portion of the screen is in a metal box sleeve used as shielding and the upper portion has no shielding, but is packaged in a PVC "Coffin". The screen meets the WIR determination ESQ-EM-IP-M435.1-1-01 and can be disposed as radioactive waste.

This waste was not forecasted as RH TRU. In the SWIFT forecast it was anticipated to be LLW and would be able to be disposed at ERDF. The life cycle planning for the waste did not anticipate the waste would characterize as TRU waste; consequently, the waste was not forecasted as RH TRU. In the Solid Waste Forecasting Tool (SWIFT) forecast it was anticipated the Saltwell screen would be low-level waste and would be disposed of at the Environmental Restoration Disposal Facility (ERDF). Because of the nature of the C111 Saltwell Screen and the dose, WRPS does not have a facility that can size-reduce the C111 Saltwell Screen and package it to meet the Waste Isolation Pilot Plant (WIPP) criteria. PermaFix Northwest (PFNW) will perform size reduction and packaging in WIPP-compliant packaging (55-gallon drums for RH-TRU Waste, and 55-gallon drums or SWBs for CH-TRU waste). PFNW is in the process of modifying their permit and does not anticipate being able to accept the C111 Saltwell Screen until July 2010.

Because of the nature of the screen and the dose, WRPS does not have a facility that can size-reduce this screen and package it to meet the WIPP criteria. We have contacted the PermaFix Northwest (PFNW) facility to determine if they would accept a modification to our existing contract to perform size reduction and packaging in WIPP compliant packaging. We are requesting acceptance of the 35 foot long C111 Saltwell Screen to be shipped directly from RMA-269 (outside of C-farm) to storage at the Central Waste Complex (CWC) until such time that PFNW can accept this waste for processing. The waste will be packaged for transport and storage in a DOT 7A Type A container such that the dose rate on the exterior of the container will not exceed 200mr/hr prior to acceptance at the CWC.

The existing waste profile WRPS-270-0001 RH TRU Waste will be used for acceptance at the CHPRC facility. The 90-day clock for this waste expires on June 29, 2010.

Please consider this request for an exception to the Hanford Site Solid Waste Acceptance Criteria. Additional information is attached.

Sincerely,

Judith A. Nielsen

Judith A. Nielsen, Manager
Waste Services
Washington River Protection Solutions LLC

Attachment: C111 Saltwell Screen (1 page)

JAN:GKS

cc: Amanda Ramirez, M&EC Waste Support Services, Technical Services Manager
Ron Koll, ORP
Mike Royack, ORP
Chris Kemp, ORP
WRPS Correspondence Control

ATTACHMENT

C111 Saltwell Screen – 35 feet long, 11 inches diameter

TRU Waste – Based on TWINS BBI calculates as RH TRU

Characterization – Dose as packaged (not shipping container) 9 – 18,000 mr/hr. Characterization is included in the waste profile.

Packaging

Inner Packaging – Double plastic wrap, metal box sleeve and PVC hinged cover (top 10')
Outer Packaging – DOT 7A Type A 60'x5'x5' Metal Box

Cost Analysis

Based on posted rates and charge by container volume, not waste volume.
This does not include future treatment cost if packaged in the future at Hanford.

60 Foot Box (plus replace box at $600K)			**Conex 8x8x40**		
CWC	PFNW	CWC Temp	CWC	PFNW	CWC Temp
$214K	$643	?+ $643	$364K	$1090	? + 1090

Enclosure II

Strategy for Classification of Hanford Tank Wastes
DRAFT

1. Establish the Classification of appropriate tank waste as non-HLW (either TRU or LLW) with a view to enabling supplemental treatment. Document origin of wastes in candidate tanks

    a. The Engineering Group (Mike Johnson) is writing a series of technical reports that will form the basis for ORP decisions on classification some of the tank wastes as either TRU waste or LLW.
    b. These technical reports will undergo peer review by a select group to check the functions, historical origin, data accuracy, statistical analysis, and any legal precedence.
    c. The first report will define the case for the B-200 and T-200 series tanks

2. Use DOE Order M 435.1-1 as pathway for Classification. Apply the criteria listed in DOE M 435.1-1, *Radioactive Waste Management Manual*, Chapter II, *High-Level Waste Requirements* to determine classification of wastes in the candidate tanks

3. Group tanks by their perceived ease of Classification to facilitate disposition. (e.g. B and T 200 series tanks are considered easier to classify, so start with these). Group tank wastes by those that can be designated by source / origin as non-HLW and those tanks tank require the citation or evaluation process (Waste Incidental to Reprocessing) to classify the waste. Priority will be given to preparing documentation for those wastes that can be classified as either TRU waste or LLW by the waste source / origin, followed by those wastes that can be classified by the citation process, "because of the ease of determining up front that they do not pose the long-term hazards associated with high-level waste".

    a. DOE G 435.1-1, *Implementation Guide for use with DOE M 435.1-1*, Chapter II, *High-Level Waste Requirements* provides the following guidance in determining the classification of wastes. [DOE G 435.1-1, page II-17]

        "The distinction between the two processes is important because it is clear from background events that citation process waste streams were so identified because of the ease of determining up front that they do not pose the long-term hazards associated with high-level waste. Evaluation process wastes, on the other hand, generally require a case-by-case evaluation and determination. <u>Consistent with this understanding, the responsibility for citation interpretations rests solely with the DOE Field Element Manager, although consultation with the Office of Environmental Management is encouraged</u>. However, the Office of Environmental Management consultation is required for waste that has been determined to be incidental through the evaluation process. In addition, it is recommended that consultation with the NRC staff be considered for evaluation process determinations, although this is not required."

4. Obtain ORP approval for classification of wastes by source / origin. For those tank wastes that can be designated by the waste source / origin, submit documentation to DOE-ORP manager for review and approval.

    a. Preliminary review of tank waste origins and characterization data indicate that the following tank wastes may be designated as TRU waste by the waste source / origin:

        T-201, T-202, T-203, T-204
        B-201, B-202, B-203, B-204
        T-111
        C-201, C-202, C-203
        AW-105

    b. Preliminary review of tank waste origins and characterization data indicate that the following tank wastes may be designated as low-level waste (LLW) by the waste source / origin:

        T-111
        U-201, U-202, U-203, U-204
        C-204

    c. The reports will consist of a rationale for the classification.

d. The reports will follow the guidelines in DOE Order 435.1.

e. The reports will be submitted to the Engineering Quality Review Board to ensure compliance with technical rigor requirements.

5. Obtain ORP and NRC approval for classification of wastes by citation / evaluation process. The approval process may be lengthy due to the existing lawsuit against the Department of Energy relating to DOE O 435.1. For those tank wastes that can be designate through the citation and evaluation process, prepare documentation for submittal to ORP and NRC for review and approval of tank wastes as incidental wastes to reprocessing of spent nuclear fuels.

   a. Preliminary review of tank waste origins and characterization data indicate that the following tank wastes may be designated as TRU waste by the evaluation process:

      AW-103 sludge
      SY-102 sludge

   b. The sludges in these tanks need separation from HLW supernate / precipitated salts to be and as TRU waste by the evaluation process.

   c. After gaining NRC approval, the ORP manager can designate these wastes as incidental to the reprocessing of spent nuclear fuel.

Strategy for Classification of Hanford Tank Wastes
DRAFT

DOE M 435.1-1 page II-1 provides the following definition of high-level waste and guidance for waste classification.

A. Definition of High-Level Waste: High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation.

B. Waste Incidental to Reprocessing: Waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing is not high level waste, and shall be managed under DOE's regulatory authority in accordance with the requirements for transuranic waste or low-level waste, as appropriate. When determining whether spent nuclear fuel reprocessing plant wastes shall be managed as another waste type or as high-level waste, either the citation or evaluation process described below shall be used:

(1) **Citation.** Waste incidental to reprocessing by citation includes spent nuclear fuel reprocessing plant wastes that meet the description included in the Notice of Proposed Rulemaking (34 FR 8712) for proposed Appendix D, 10 CFR Part 50, Paragraphs 6 and 7. These radioactive wastes are the result of reprocessing plant operations, such as, but not limited to: contaminated job wastes including laboratory items such as clothing, tools, and equipment.

(2) Evaluation. Determinations that any waste is incidental to reprocessing by the evaluation process shall be developed under good record-keeping practices, with an adequate quality assurance process, and shall be documented to support the determinations. Such wastes may include, but are not limited to, spent nuclear fuel reprocessing plant wastes that:

(a) Will be managed as low-level waste and meet the following criteria:

1. Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C, *Performance Objectives*; and
3. Are to be managed, pursuant to DOE's authority under the *Atomic Energy Act of 1954*, as amended, and in accordance with the provisions of Chapter IV of this Manual, provided the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55, *Waste Classification*; or will meet alternative requirements for waste classification and characterization as DOE may authorize.

(b) Will be managed as transuranic waste and meet the following criteria:

1. Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. Will be incorporated in a solid physical form and meet alternative requirements for waste classification and characteristics, as DOE may authorize; and
3. Are managed pursuant to DOE's authority under the *Atomic Energy Act of 1954*, as amended, in accordance with the provisions of Chapter III of this Manual, as appropriate.

Note: In the *Nuclear Waste Policy Act of 1982*, as amended, the term high-level radioactive waste is defined as:

"(a) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that <u>contains fission products in sufficient concentrations</u>; and (b) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation."

DOE G 435.1-1, *Implementation Guide for use with DOE M 435.1-1*, Chapter II, *High-Level Waste Requirements* provides the following guidance in determining the classification of wastes.

> The NRC has posited that, "radioactive wastes that have historically been referred to as high-level waste, i.e., reprocessing wastes, are initially both intensely radioactive and long-lived" *(52 FR 5994*). However, these wastes contain a wide variety of radionuclides with some (e.g., Sr-90, Cs-137) having a relatively short half-life yet representing a large fraction of the radioactivity for the first few centuries after the wastes are produced. These nuclides produce significant amounts of heat and radiation, both of which are of concern when managing such wastes. [DOE G 435.1-1, page II-2]

> The Nuclear Regulatory Commission "considers that these two characteristics, intense radioactivity for a few centuries followed by a long-term hazard requiring permanent isolation, are key features which can be used to distinguish high-level wastes from other waste categories" *(52 FR 5994).*
> [DOE G 435.1-1, page II-3]

> DOE M 435.1-1 supports the implementation of part (2) of the 10 CFR Part 60 definition to mean that high-level wastes are wastes that are generated as a product of reprocessing of spent nuclear fuel downstream of, and including, the first step in a separations process, and the consistent waste streams from subsequent extraction cycles or steps. Separation processes include aqueous separation processes, e.g., the Redox and the Purex processes, and nonaqueous processes, e.g., pyrometallurgical and pyrochemical processes. Wastes that are produced upstream of these separations processes, from such processes as chemical or mechanical decladding, fuel dissolution, cladding separations, conditioning, or accountability measuring, are not high-level waste. Such wastes are considered processing wastes and should be managed in accordance with the appropriate Chapters of DOE M 435.1-1, as either transuranic, mixed low-level, or low-level waste. In addition, these wastes may be commingled with materials-in-process that require further processing to separate desired materials from wastes. [DOE G 435.1-1, page II-6]

FOR PARALLEL CONCURRENCE

Date Received for Clearance Process (MM/YY/DD) 01/04/15	INFORMATION CLEARANCE FORM
A. Information Category	B. Document Number DOE/ORP-2004-01
☐ Abstract ☐ Journal Article ☐ Summary ☐ Internet ☐ Visual Aid ☐ Software ☒ Full Paper ☐ Report ☐ Other ______	C. Title BASIS FOR DESIGNATING CERTAIN HANFORD SINGLE-SHELL TANK (SST) WASTES RESULTING FROM THE BISMUTH-PHOSPHATE PROCESS (BPP) AS TRANSURANIC WASTE (TRU) D. Internet Address

E. Required Information

1. Is document potentially Classified? ☒ No ☐ Yes (MANDATORY)

Manager's Signature Required

If Yes N/A ☐ No ☐ Yes Classified
ADC Signature Required

2. References in the Information are Applied Technology ☒ No ☐ Yes
Export Controlled Information ☒ No ☐ Yes

3. Does Information Contain the Following: (MANDATORY)
   a. New or Novel (Patentable) Subject Matter? ☒ No ☐ Yes
   If "Yes", Disclosure No.:
   b. Information Received in Confidence, Such as Proprietary and/or Inventions?
   ☒ No ☐ Yes If "Yes", Affix Appropriate Legends/Notices.
   c. Copyrights? ☒ No ☐ Yes If "Yes", Attach Permission.
   d. Trademarks? ☒ No ☐ Yes If "Yes", Identify in Document.
4. Is Information requiring submission to OSTI? ☒ No ☐ Yes
5. Release Level? ☒ Public ☐ Limited

F. Complete for a Journal Article

1. Title of Journal N/A

G. Complete for a Presentation

1. Title for Conference or Meeting N/A
2. Group Sponsoring N/A
3. Date of Conference N/A
4. City/State N/A
5. Will Information be Published in Proceedings? ☐ No ☐ Yes
6. Will Material be Handed Out? ☐ No ☐ Yes

H. Author/Requestor	Responsible Manager
William Hewitt (Print and Sign)	Howard B. Gnann (Print and Sign)

I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☒	Scott D Stubblebine	[signature]	(Y) / N
Office of External Affairs	☒	T. Erik Olds	T. Erik Olds	(Y) / N
DOE-ORP (SWAILES)	☒			Y / N
Other H. GNANN	☒	H		Y / N
Other	☐			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

☐ Applied Technology ☐ Protected CRADA
☐ Personal/Private ☐ Export Controlled
☐ Proprietary ☐ Procurement-Sensitive
☐ Business-Sensitive ☐ Patentable
☐ Predecisional ☐ Other (Specify) ______
☐ UCNI

Information Clearance Approval

APPROVED FOR RELEASE
OFFICIAL DOCUMENT
CW
Date 2/26/04

page 1 of 3

K. If Additional Comments, Please Attach Separate Sheet

A-6001-401 (12/00)

FOR PARALLEL CONCURRENCE

Date Received for Clearance Process (MM/YY/DD) 01/04/15	**INFORMATION CLEARANCE FORM**

A. Information Category

- ☐ Abstract
- ☐ Journal Article
- ☐ Summary
- ☐ Internet
- ☐ Visual Aid
- ☐ Software
- ☒ Full Paper
- ☐ Report
- ☐ Other ______

B. Document Number DOE/ORP-2004-01

C. Title BASIS FOR DESIGNATING CERTAIN HANFORD SINGLE-SHELL TANK (SST) WASTES RESULTING FROM THE BISMUTH-PHOSPHATE PROCESS (BPP) AS TRANSURANIC WASTE (TRU)

D. Internet Address

E. Required Information

1. Is document potentially Classified? ☒ No ☐ Yes (MANDATORY)

______ Manager's Signature Required

If Yes N/A ADC Signature Required ☐ No ☐ Yes Classified

2. References in the Information are Applied Technology ☒ No ☐ Yes

Export Controlled Information ☒ No ☐ Yes

3. Does Information Contain the Following: (MANDATORY)

a. New or Novel (Patentable) Subject Matter? ☒ No ☐ Yes

If "Yes", Disclosure No.: ______

b. Information Received in Confidence, Such as Proprietary and/or Inventions? ☒ No ☐ Yes If "Yes", Affix Appropriate Legends/Notices.

c. Copyrights? ☒ No ☐ Yes If "Yes", Attach Permission.

d. Trademarks? ☒ No ☐ Yes If "Yes", Identify in Document.

4. Is Information requiring submission to OSTI? ☒ No ☐ Yes

5. Release Level? ☒ Public ☐ Limited

F. Complete for a Journal Article

1. Title of Journal N/A

G. Complete for a Presentation

1. Title for Conference or Meeting N/A
2. Group Sponsoring N/A
3. Date of Conference N/A
4. City/State N/A
5. Will Information be Published in Proceedings? ☐ No ☐ Yes
6. Will Material be Handed Out? ☐ No ☐ Yes

H. Author/Requestor (Print and Sign)

Responsible Manager (Print and Sign)

I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☒			Y / N
Office of External Affairs	☒			Y / N
DOE-ORP (SWAILES)	☒	Stephen J. Wiegman	[signature]	(Y) / N
Other H. GNANN	☒	HOWARD GNANN	[signature]	(Y) / N
Other	☐			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

Information Clearance Approval

- ☐ Applied Technology
- ☐ Protected CRADA
- ☐ Personal/Private
- ☐ Export Controlled
- ☐ Proprietary
- ☐ Procurement-Sensitive
- ☐ Business-Sensitive
- ☐ Patentable
- ☐ Predecisional
- ☐ Other (Specify) ______
- ☐ UCNI

Page 2 of 3

K. If Additional Comments, Please Attach Separate Sheet

A-6001-401 (12/00)

FOR PARALLEL CONCURRENCE

Date Received for Clearance Process (MM/YY/DD) 01/04/15	**INFORMATION CLEARANCE FORM**

A. Information Category

- [ ] Abstract
- [ ] Journal Article
- [ ] Summary
- [ ] Internet
- [ ] Visual Aid
- [ ] Software
- [x] Full Paper
- [ ] Report
- [ ] Other ______

B. Document Number: DOE/ORP-2004-01

C. Title: BASIS FOR DESIGNATING CERTAIN HANFORD SINGLE-SHELL TANK (SST) WASTES RESULTING FROM THE BISMUTH-PHOSPHATE PROCESS (BPP) AS TRANSURANIC WASTE (TRU)

D. Internet Address

E. Required Information

1. Is document potentially Classified? [x] No [ ] Yes (MANDATORY)

Manager's Signature Required

If Yes N/A [ ] No [ ] Yes Classified

ADC Signature Required

2. References in the Information are Applied Technology [x] No [ ] Yes

Export Controlled Information [x] No [ ] Yes

3. Does Information Contain the Following: (MANDATORY)

a. New or Novel (Patentable) Subject Matter? [x] No [ ] Yes

If "Yes", Disclosure No.: ______

b. Information Received in Confidence, Such as Proprietary and/or Inventions? [x] No [ ] Yes If "Yes", Affix Appropriate Legends/Notices.

c. Copyrights? [x] No [ ] Yes If "Yes", Attach Permission.

d. Trademarks? [x] No [ ] Yes If "Yes", Identify in Document.

4. Is Information requiring submission to OSTI? [x] No [ ] Yes

5. Release Level? [x] Public [ ] Limited

F. Complete for a Journal Article

1. Title of Journal N/A

G. Complete for a Presentation

1. Title for Conference or Meeting N/A
2. Group Sponsoring N/A
3. Date of Conference N/A
4. City/State N/A
5. Will Information be Published in Proceedings? [ ] No [ ] Yes
6. Will Material be Handed Out? [ ] No [ ] Yes

H. Author/Requestor (Print and Sign) | Responsible Manager (Print and Sign)

I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	[x]			Y / N
Office of External Affairs	[x]			Y / N
DOE-ORP (SWAILES)	[x]			(Y) / N
Other H. GNANN	[x]			Y / N
Other	[ ]			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below. | Information Clearance Approval

- [ ] Applied Technology
- [ ] Personal/Private
- [ ] Proprietary
- [ ] Business-Sensitive
- [ ] Predecisional
- [ ] UCNI
- [ ] Protected CRADA
- [ ] Export Controlled
- [ ] Procurement-Sensitive
- [ ] Patentable
- [ ] Other (Specify) ______

page 3 of 3

K. If Additional Comments, Please Attach Separate Sheet

DOE/ORP-2004-01
Revision 0

Basis for Designating Certain Hanford Single-Shell Tank Waste Resulting from the Bismuth-Phosphate Process as Transuranic Waste

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Office of River Protection

P.O. Box 450
Richland, Washington 99352

DOE/ORP-2004-01
Revision 0

Basis for Designating Certain Hanford Single-Shell Tank Waste Resulting from the Bismuth-Phosphate Process as Transuranic Waste

W. M. Hewitt, YAHSGS LLC

February 2004

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Office of River Protection

P.O. Box 450
Richland, Washington 99352

J. Aardal for
C. Willingham | 2-26-2004 | N/A
Clearance Approval | Date | Release Approval (stamp)

DOE/ORP-2004-01
Revision 0

For use with Technical Documents (when appropriate)	
EDC-	FMP-
EDT-	ECN-
Project No.:	Division:
Document Type: RPT	Page Count:

For use with Speeches, Articles, or Presentations (when appropriate)							
Abstract		Summary		Full Paper		Visual Aid	
Conference Name:							
Conference Date:							
Conference Location:							
Conference Sponsor:							
Published in:							
Publication Date:							

DOE/ORP-2004-01

Basis for Designating Certain Hanford Single-Shell Tank (SST) Wastes Resulting from the Bismuth-Phosphate Process (BPP) as Transuranic Waste (TRU)

January 2004

Prepared by YAHSGS LLC, Richland, WA under Contract ORP-YAH001 to the Project Assistance Corporation in Support of the Department of Energy, Office of River Protection

Preface

Although historically the Department of Energy (DOE) has managed wastes within the Hanford tank farms as High-Level Wastes (HLW) as a matter of operations management policy, DOE has long maintained that, based on origin, process history, and radiological characteristics, the wastes in any specific tank may actually be HLW, Transuranic Waste (TRU), or Mixed Low-Level Waste (MLLW). DOE, therefore, has planned to appropriately designate wastes into one of those categories once the wastes are ready for retrieval for treatment and disposal.

Accordingly, the DOE Office of River Protection (ORP) identified 11 Single-Shell Tanks (SSTs) that contain wastes from the Bismuth-Phosphate Process (BPP). The BPP, the first production-scale Spent Nuclear Fuel (SNF) reprocessing process ever used, was deployed during the Manhattan Project (World War II) to separate plutonium from SNF. The BPP was only used at Hanford and was replaced 50 years ago by more efficient solvent extraction reprocessing processes, i.e., Reduction and Oxidation (REDOX) and Plutonium-Uranium Extraction (PUREX). An important feature of the BPP relative to waste designation is that it was a batch process, a feature that allows ORP to clearly distinguish where SNF existed (or did not exist) within the process. The BPP used chemical additions to selectively dissolve and precipitate plutonium compounds so that the plutonium could be separated from other SNF constituents by liquid/solids separations via centrifugation. Multiple water washes, each followed by centrifugation, ensured very high degrees of solids separation from process liquids, e.g., separation of plutonium precipitates from liquids produced directly in SNF reprocessing.

The BPP created HLW that will be treated in the Waste Treatment Plant currently under construction at Hanford and subsequently disposed of in the national repository. The BPP also produced waste streams that are not HLW by origin as those wastes were not produced during the reprocessing of SNF. The fact that the wastes are not HLW is confirmed by waste fission product concentrations that are orders of magnitude less than those the U.S. Nuclear Regulatory Commission requires to be disposed of in a geologic repository (10 CFR Part 61, Low-Level Radioactive Waste Disposal).

This document explains the BPP and identifies which BPP steps produced HLW and which did not on the basis of where SNF reprocessing actually took place within the series of BPP batch treatment steps. As a result, this document provides a technical and regulatory basis for DOE-ORP to determine that wastes from the BPP that are now contained in 11 Hanford SSTs (B-201, B-202, B-203, B-204, T-201, T-202, T-203, T-204, T-104, T-110, and T-111) are TRU due to waste origin and confirmed by radionuclide content. This document was developed in full consideration of extensive technical evaluations of historical BPP and tank farm source documents and records that were performed by the current Hanford tank farm contractor, CH2M HILL Hanford Group, Inc. (CH2M HILL). CH2M HILL's evaluations included historical records and process information produced by Hanford site contractors that operated the BPP over its 1945–1954 operating history. Information derived from those historical documents is consistent with the radioactive and chemical characteristics of the wastes in the 11 SSTs. Accordingly, this document is believed to provide a reasonable and sound basis to support a DOE-ORP determination that the wastes in the 11 SSTs identified above are TRU. Once those wastes are put into a suitable form for disposal, appropriately packaged, and characterized in a manner that conforms to the Waste Isolation Pilot Plant (WIPP) waste acceptance criteria and permit requirements, those wastes should be suitable for disposal at WIPP.

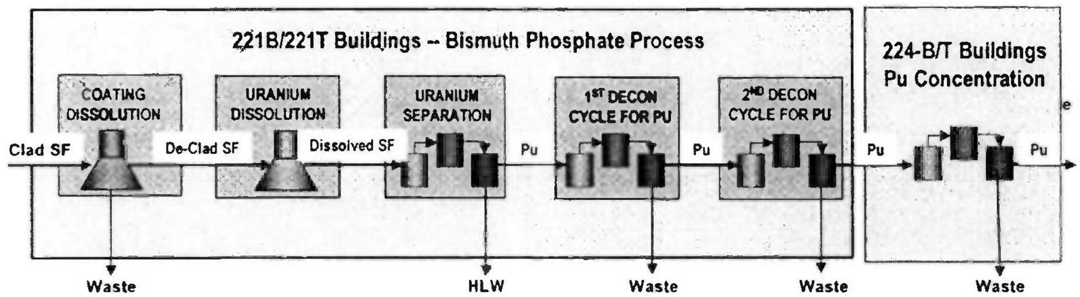
Table of Contents

Preface i
Table of Contents ii
Executive Summary iii
Basis for Designating Certain Hanford Tank Wastes as TRU 1
1.0 BACKGROUND – Hanford Wastes Vary Significantly Tank-to-Tank 1
2.0 BISMUTH PHOSPHATE PROCESS 3
2.1 Coating Dissolution (Decladding – Figure 4, Block 2.1) 4
2.2 Uranium Dissolution and Uranium Separation (Figure 4, Block 2.2) 4
2.3 Plutonium Decontamination (Figure 4, Block 2.3, 1st and 2nd Decon Cycles) 5
2.4 Plutonium Concentration Building (224-B/T) Wastes (Figure 4, Block 2.4) 5
3.0 CLASSIFICATION OF TANK WASTES FROM THE BISMUTH PHOSPHATE PROCESS 6
3.1 Where Did Spent Nuclear Fuel Reprocessing Occur? 7
3.2 Which Liquid Wastes Were Produced Directly In Reprocessing? 8
3.3 Which BPP Wastes Are HLW? 8
5.0 REFERENCES 12
APPENDIX A – Chemical Reactions for the Bismuth Phosphate Flow Sheet 1
APPENDIX B – Bismuth Phosphate and PUREX Process Waste Stream Characteristics 1

Executive Summary

The diverse nature of Hanford's tank waste generation operations over the past 60 years has led to large tank-to-tank differences in radioactive material concentrations. Understanding how and why these differences occurred is important to reaching sound waste management decisions. Of particular interest are wastes generated from the Bismuth Phosphate Process (BPP), the first ever Spent Nuclear Fuel (SNF) reprocessing and Plutonium (Pu) recovery process. That is, in part, because wastes generated by several BPP process steps are candidates for a Transuranic Waste (TRU) determination as illustrated and discussed below.

The BPP, unlike later Hanford solvent extraction-based reprocessing approaches (i.e., REDOX and PUREX), consisted of a series of individual batch processes which selectively dissolved and precipitated specific materials to recover Pu. It achieved thorough liquid/solids separation via centrifugation and multiple water rinses of the centrifuge solids cake, thereby removing liquids and soluble materials from the cake. Each batch process step resulted in an extensive and selective separation of the process wastes from the process product streams. As a result, out of the five distinct BPP process steps (coating dissolution, U dissolution, U separation, 1st decontamination cycle for Pu, 2nd decontamination cycle for Pu,), only two involved SNF reprocessing: U dissolution and U separations.



The coating removal process did not create High-Level Waste (HLW) because it only dissolved the aluminum coating leaving the SNF intact. That process did not dissolve SNF and its wastes were mildly contaminated.

HLW including all liquids produced directly in the reprocessing of SNF existed only within the U dissolution and U separation processes. Acids introduced during U dissolution dissolved the SNF, placing the Pu, the U, and all of the fission products in solution. The U separation processes then selectively precipitated the Pu, leaving the U and fission products in solution.

The liquid waste from U separations contained over 99.5% of the SNF constituent elements including >99.5% of the U, ~99% of the Cs-137, and ~90% of the Sr-90 (DuPont 1944). The liquid and solid wastes produced during U dissolution and U separation therefore fall squarely within the definition of HLW as set forth in the Nuclear Waste Policy Act of 1982 (NWPA). The extensive liquid/solids separations and multiple rinses conducted during U separations assured that any liquid wastes produced directly in reprocessing were discharged as liquid wastes and did not follow the Pu precipitate into the 1st or 2nd decontamination cycles or beyond.

The Pu precipitate, once triple rinsed, contained >99.5% of the Pu, <0.5% of the U, and ~10% of the fission products. At least half of the fission products were short-lived isotopes that decayed to deminimis levels within 1-2 years. Because the SNF constituent elements were separated during U separations, no SNF was present in the subsequent decontamination cycles. Accordingly, wastes from the 1st and 2nd decontamination cycles and Pu concentration process are not HLW based on the NWPA HLW definition.

The low fission product concentrations in those wastes is consistent with a non-HLW designation. Therefore, on the basis of origin and content, the wastes in the 11 SSTs that received the wastes from coating removal, the 1st and 2nd decontamination cycles, and Pu concentration (T-104, T-110, T-111, B-201 through B-204, T-201 through T-204) are not HLW.

Moreover, the wastes in those 11 SSTs meet the definition of transuranic waste set forth in the NWPA and the Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act of 1996 and are, therefore, candidates for disposal at WIPP in New Mexico.

Basis for Designating Certain Hanford Tank Wastes as TRU

1.0 BACKGROUND – Hanford Wastes Vary Significantly Tank-to-Tank

Hanford's 149 SSTs, 28 Double-Shell Tanks (DSTs), and 60 Miscellaneous Underground Storage Tanks (MUSTs) collectively store ~54 million gallons of radioactive mixed defense wastes containing ~190 million curies of radioactivity. The wastes in those tanks have varying origins. For example, although extensive SNF reprocessing operations were conducted at Hanford, not all tank wastes originated during the reprocessing of SNF. Tank wastes were produced by a number of Hanford defense-related operations associated with removing cladding from SNF, purifying the Pu product, decontaminating equipment/facilities, and performing laboratory analyses. Rather than being the actual reprocessing of SNF, these operations occurred prior to, following, or incidental to SNF reprocessing. This diversity in Hanford's tank waste generation operations resulted in large tank-to-tank radioactive material concentration differences. Understanding these differences is important to sound waste management decisionmaking. The magnitude of the large tank-to-tank radionuclide concentration differences are graphically and numerically illustrated in Figures 1 and 2, respectively. For example, the five tanks[1] with the highest inventories of radioactive materials in Figure 1 collectively contain ~ 50 million curies whereas the 10 tanks[2] with the lowest radioactive material inventories collectively contain less than 5 thousand curies; this is a factor of 10,000 difference. Furthermore, specific radionuclide concentrations can vary by factors greater than 1 million from tank-to-tank as illustrated in Figure 2 for Cs-137 and Sr-90, the two most prominent radionuclides in the tanks.

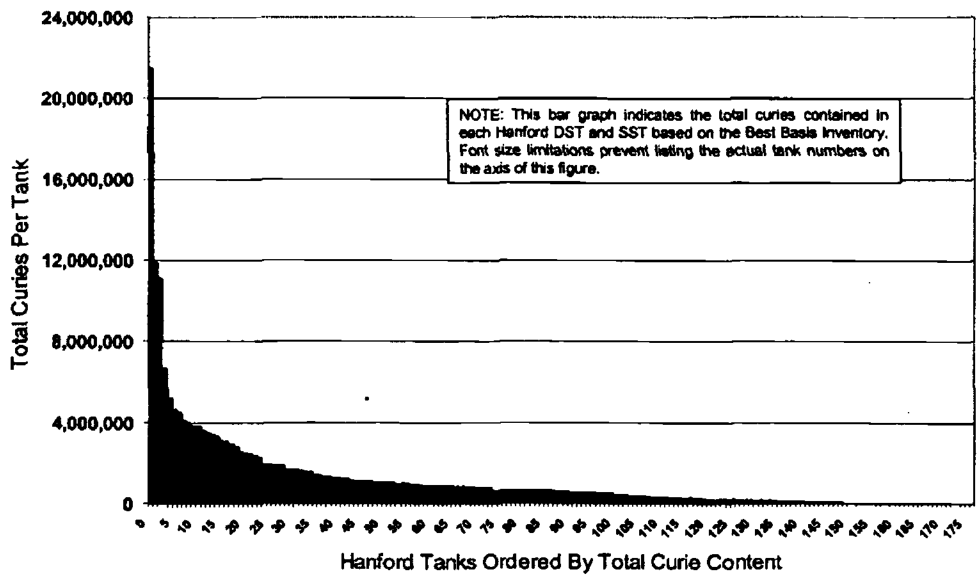


Figure 1. Radionuclide Inventories in the Hanford Tanks Span Over Four Orders of Magnitude

[1] In order of curie inventory, high to low, the tanks are AZ-101, AZ-102, AY-102, A-105, and AX-104.
[2] Not ordered by curie inventory, the tanks are B-201, -202, -203. -204; T-201, -202, -203, - 204; and U-203 and U-204.

Source: Best Basis Inventory in the TWINS Database

There are several reasons why there is such a wide range of fission product inventories in the Hanford tanks. First, while some tanks received highly radioactive wastes produced during the reprocessing of SNF, other tanks did not. Second, the BPP, the world's first production-level reprocessing process which was carried out at Hanford during the Manhattan Project starting in 1944, created large quantities of relatively low-curie waste compared to the waste produced by later, substantially more efficient processes such as REDOX and PUREX. Third, a 1960s/1970s Hanford tank waste campaign extracted large amounts of Cs-137 from liquids in most Hanford tanks and Sr-90 from wastes in the A and AX Farm tanks. That campaign reduced the collective Hanford tank farms fission product content by approximately 40%[3]. Fourth, tank capacities vary from 55,000 gallons to over 1 million gallons and tanks are filled to varying degrees.

	Cs-137		Sr-90	
	(Ci/liter)	Tank	(Ci/liter)	Tank
Highest Concentration	~1.9	AX-104	~79	AX-104
Lowest Concentration	0.00001	T-204	<0.000003	T-202
Ratio (High/Low)	200,000		30,000,000	

Figure 2. Highest and Lowest Cs-137 and Sr-90 Concentrations in Hanford Tanks
Source: Best Basis Inventory in Hanford TWINS Database

This variability in waste sources and concentrations has led DOE to consider the origin and the characteristics of wastes in each tank in planning its treatment and disposal strategies. Some examples of wastes discharged to tanks that did not originate directly during the reprocessing of SNF include:

- Decladding wastes resulting from dissolving the metallic cladding (coating) from the SNF in order to expose the actual fuel to reprocessing acids.
- Wastes from processes used to clean and/or concentrate recovered Pu product materials in order to achieve requisite Pu purity levels for weapons use.
- Laboratory wastes resulting from the sampling and analysis of various process and waste streams resulting from Hanford operations.
- Wastes from the cleanup of contaminated facilities and/or equipment.

Regardless of the characteristics or origin of the waste in any given tank, as a matter of policy, DOE manages the Hanford tank farm wastes as HLW while those wastes are stored in the tanks. This does not mean that DOE classified the wastes as HLW but rather, that DOE employs an appropriately conservative management practice to ensure that the highest levels of safety and best management practices are in place during the storage, retrieval, and handling of the Hanford tank farm wastes.

In the sections that follow, the BPP is described with a focus on determining (a) when SNF was present such that the "reprocessing of SNF" actually occurred in a process, (b) which BPP

[3] The cesium and strontium were converted to cesium chloride and strontium fluoride and encapsulated. The campaign was undertaken to reduce the decay heat load on the tanks, however, beneficial uses for the capsules were sought and many capsules were deployed on commercial and government initiatives.

processes created "liquid waste produced directly in reprocessing [of SNF]", and (c) which BPP processes appear to have resulted in solid materials with "fission products in sufficient concentrations" to warrant permanent isolation. The BPP is compared and contrasted as appropriate with the PUREX process for the simple reason that most people think of the PUREX process when they think of reprocessing. PUREX was used across the DOE weapons complex for Pu and Uranium (U) recovery. It was used in the United States on a limited basis for commercial reprocessing. Finally, PUREX is used internationally for commercial and defense reprocessing purposes (PNNL 1998). Conversely, the BPP was an earlier process used only at Hanford in the U.S. Government's first production-level campaigns to recover Pu for defense purposes. It processed less than 8% of the SNF reprocessed at Hanford.

2.0 BISMUTH PHOSPHATE PROCESS

As illustrated in Figure 3, the BPP[4] was carried out in 221-T plant from 1944 to 1956 and in 221-B plant from 1945 to 1952. As the first reprocessing process ever used at production levels to separate Pu from SNF, it was conceived with an emphasis on time and purpose rather than efficiency. The BPP was a batch process. It deployed a complex chemistry that selectively dissolved and precipitated targeted chemical compounds such that simple liquid/solids separations equipment (centrifuges) could isolate Pu from the other materials in the SNF as well as materials introduced in the BPP. To place the process in perspective, the Government's objective was to separate the one part Pu produced in the fission process from the roughly 10,000 parts of U and fission products that it was dispersed amongst in the SNF.

The BPP was quite different from successor reprocessing processes. For example, its sole purpose was to recover Pu. Uranium was discharged as a waste. Conversely, REDOX and PUREX recovered Pu and U, each as a separate product. Also, REDOX and PUREX were continuous solvent extraction processes which used a small fraction of the chemical additives that the BPP required for separations. As a result, the BPP created over 200 times more waste than PUREX per ton of U fuel processed. The BPP U Separations process created approximately ~3800 gallons of HLW per ton of U (GE 1951) while PUREX created ~40 gallons per ton (ARHCO 1968). This resulted in Hanford's PUREX wastes having substantially higher fission product concentrations than BPP wastes. For example, wastes discharged from the BPP U Separations process, the BPP waste stream with the highest fission product concentrations, were reported to have Cs-137 concentrations of approximately 60 Ci/m^3 (GE 1955), < 0.5% of the 13,000 Ci/m^3 Cs-137 concentrations in PUREX 1st

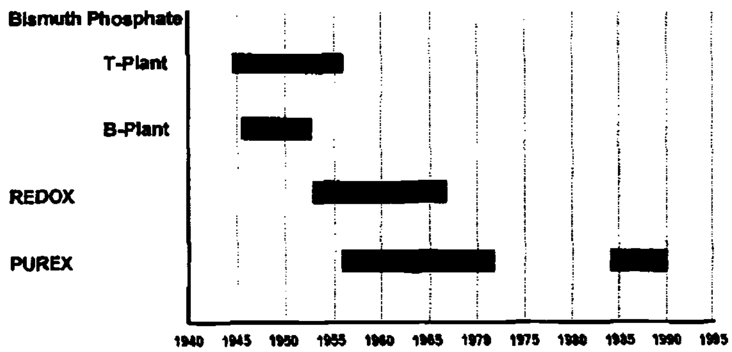


Figure 3. Operating Time Frames for Spent Nuclear Fuel Reprocessing Processes at Hanford

[4] The BPP flowsheets are provided in Attachment A and comparisons between the BPP and the PUREX process wastes are provided in Attachment B.

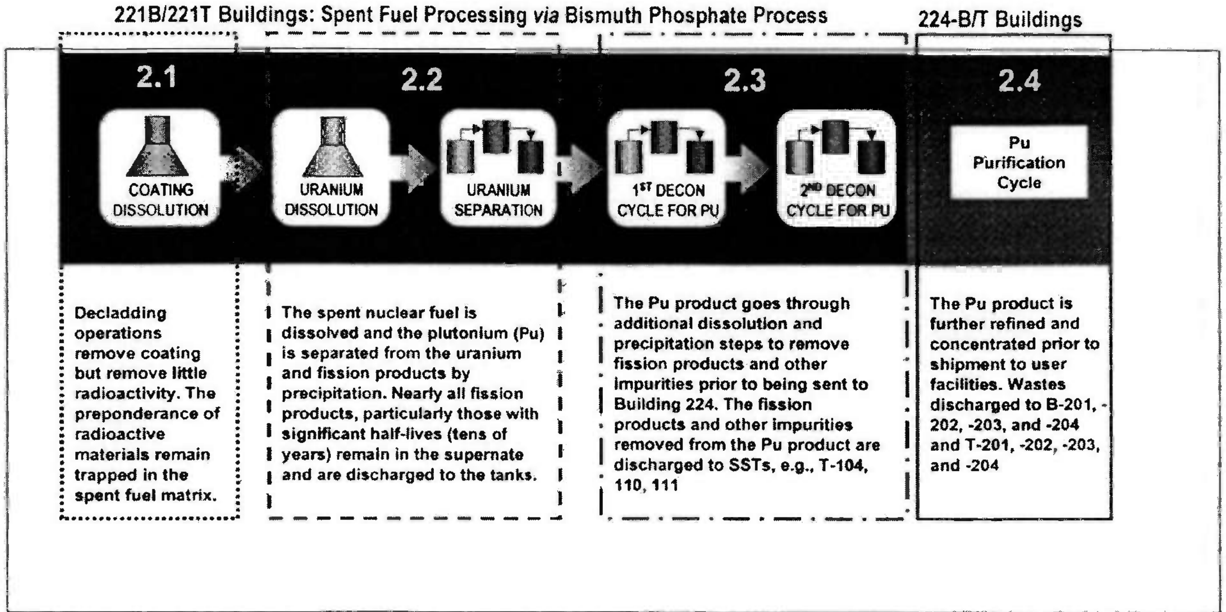


Figure 4. Generalized Bismuth Phosphate Process Flow Diagram
Source: Johnson 2003.

cycle raffinate wastes after neutralization (ARHCO 1968).

Figure 4 depicts the major BPP steps. The discussion that follows traces the SNF, the Pu product, and the process wastes through the BPP [Note that the numbering of the subsections that follow correspond to the numbers within each outlined block in Figure 4]. The following discussions include general information regarding the chemical processes used. More detail regarding the BPP chemistry and mass flow information can be found in Attachment A.

2.1 Coating Dissolution (Decladding – Figure 4, Block 2.1)

Prior to the actual reprocessing of SNF, the aluminum cladding (or coating) had to be removed to expose the U to the acids that would be used to dissolve it. A boiling sodium nitrate/sodium hydroxide solution was used to dissolve cladding. While virtually all of the radioactive fission products remained within the intact spent fuel matrix, small amounts of radioactive materials at the surface of the fuel slugs entered decladding solutions. Decladding operations are considered a "head end" process and not part of SNF reprocessing since the SNF remained intact throughout the decladding process. The decladding wastes were subsequently combined with 1st cycle Pu decontamination waste (discussed in Section 2.3) to use the excess sodium hydroxide in the decladding wastes to neutralize acids in the 1st cycle decontamination wastes.

2.2 Uranium Dissolution and Uranium Separation (Figure 4, Block 2.2)

Following decladding, the U fuel slugs were dissolved in nitric acid. Once dissolved, water and sulfuric acid were added to convert the uranyl nitrate to uranyl sulfate. Next, bismuth nitrate and phosphoric acid were then added and a bismuth phosphate carrier was formed that extracted Pu from solution as a precipitate. The uranyl sulfate remained in solution along with nearly all of the cesium and approximately 90% of the strontium (CH2M HILL 2002). The bismuth phosphate carrier and Pu were then precipitated as a filter cake via centrifuging, the filter cake was rinsed with water and re-centrifuged three times to remove any waste liquids and soluble fission products that may have been initially entrained in the filter cake, and then the Pu cake was transferred to the first Pu decontamination cycle (GE 1951).

Approximately 10% of the fission products that were dissolved with the U stayed with the Pu cake when it moved from U separations to the first Pu decontamination cycle. In addition to strontium, substantial quantities of short-lived[5] fission products, such as zirconium-95 (Zr-95) and niobium-95 (Nb-95), were co-precipitated.

2.3 Plutonium Decontamination (Figure 4, Block 2.3, 1st and 2nd Decon Cycles)

In the first Pu decontamination cycle, the Pu was oxidized to the +6 valence state via the addition of sodium bismuthate and sodium dichromate. Sodium bismuthate, phosphoric acid, zirconium nitrate, and cerium nitrate were added to precipitate bismuth phosphate and fission products (primarily strontium, cerium, and zirconium). The bismuth phosphate and fission product precipitate were centrifuged to separate them from the Pu which remained in the liquid phase. Following separation, the Pu in the liquid phase was reacted with bismuth subnitrate and phosphoric acid to produce a bismuth phosphate carrier and co-precipitate plutonium phosphate. The bismuth phosphate carrier and plutonium phosphate solids were separated from the liquids by centrifugation. The plutonium phosphate solids were water washed and centrifuged three times. The bismuth phosphate and plutonium phosphate solids were then dissolved in nitric acid, forming plutonium nitrate and bismuth nitrate in solution. This solution was then transferred to the second decontamination cycle where the first decontamination process steps (except for zirconium nitrate and cerium nitrate addition) were repeated to further purify the Pu product.

2.4 Plutonium Concentration Building (224-B/T) Wastes (Figure 4, Block 2.4)

The Pu from 221-B/T plants was transferred to the 224-B/T Pu Concentration Building to remove the bismuth phosphate and residual fission products which were essentially all short half-life contaminants. The Pu solution was received at 224-B/T in a +4 valence state. It was first oxidized with sodium bismuthate to a +6 valence state. Phosphoric acid was added to precipitate bismuth phosphate along with residual Zr-95 and Nb-95 fission products, which were then removed by centrifugation leaving the Pu in solution. Hydrogen fluoride and lanthanum fluoride were added to precipitate remaining fission products leaving the Pu in solution. Hydrogen fluoride and lanthanum salts were then added to create lanthanum fluoride and plutonium fluoride solids which were separated by centrifugation. The lanthanum fluoride and plutonium fluoride solids were reacted with potassium hydroxide to produce lanthanum hydroxide and plutonium hydroxide. The lanthanum hydroxide and plutonium hydroxide solids were reacted with nitric acid to produce the high purity Pu nitrate/lanthanum nitrate product.

Targeted radionuclides for removal were primarily short-lived fission product and daughter isotopes of zirconium, cerium, lanthanum, ruthenium, praseodymium, and yttrium (DuPont 1945), many of which were difficult to physically separate from the Pu via precipitation

[5] Zr-95 has a 64-day half-life and Nb-95 a 35-day half-life. In addition to the Zr-95, other phosphate insoluble short-lived fission products such as Ce-144 (~284 days) were removed to achieve the desired plutonium purity and handling characteristics. The fission products of concern relative to long-term waste management and disposal are Cs-137 (~30 years) and Sr-90 (~29 years) which together with their daughters, Ba-137m and Y-90, account for ~99% of the curies in the Hanford tanks at the present time.

processes. Thus, multiple precipitation steps were used in the first and second Pu decontamination cycles and the Pu Concentration Building to separate these short-lived fission products from the Pu product.

3.0 CLASSIFICATION OF TANK WASTES FROM THE BISMUTH PHOSPHATE PROCESS

Although the BPP is referred to using the generic term 'reprocessing', the BPP actually consisted of batch chemical process operations. Unlike the later solvent extraction processes (REDOX, PUREX) which were continuous flow and continuously connected, each operation within the BPP took place on a batch basis. Figure 5 illustrates a typical BPP process step. Feed material enters a process tank. The feed could consist of a re-dissolved solids (such as SNF or a Pu cake) from a centrifuge or it could be the liquid phase from a centrifuge as illustrated in Figure 5. In either case, chemical additives (such as those listed in Section 2) are used to selectively keep certain chemical species in solution and to precipitate other species. The mixture is then transferred to a centrifuge where the solids are separated from the liquids by centrifugal force. The liquids are discharged from the centrifuge as it spins and the solids are retained. The tank where the feed and additives were mixed is then rinsed with water to ensure all precipitates are removed. Clean rinse water is sprayed onto the solids in the centrifuge (~3 parts water to 1 part solids) while it operates to replace any process liquids that may have been entrained in the solid cake. The centrifuge is operated two cycles to de-water the cake. Water is again sprayed onto the solids in the centrifuge in a second cake rinse (~3 parts water to 1 part solids) while it operates to wash trace quantities of dilute process liquids from the solid cake. The centrifuge is operated two cycles to de-water the cake. All liquids including rinses pass on to the next process step or are discharged as a waste based on the specific process operation. The solids are dissolved and then transferred to the next BPP process or discharged as a waste, again based on the specific BPP process operation.

In the manner discussed above, each BPP batch process achieved a highly effective liquid/solids separation without cross contamination between batch operations.

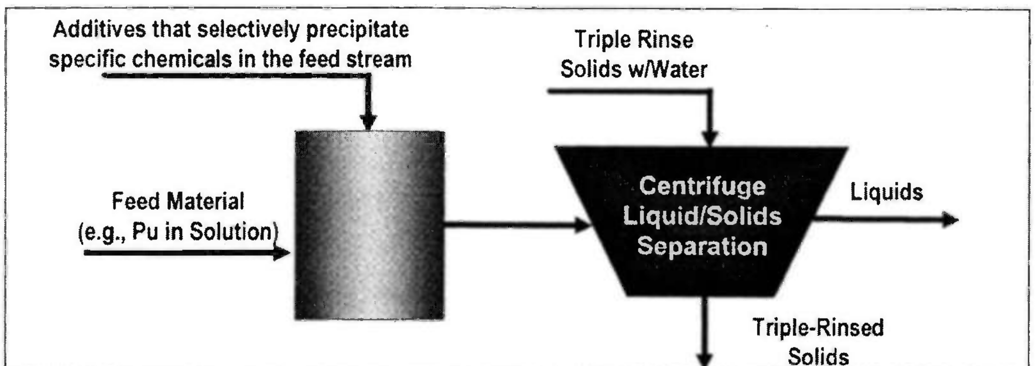


Figure 5 – Typical Bismuth Phosphate Process Operation

The clean separation liquid/solid separations and distinct break between BPP operations provides an ability to clearly demark where reprocessing of SNF did and did not occur, where "liquid waste produced directly in reprocessing" was present and where it was not, and consequently, which BPP process operations created HLW and which did not. The process logic is described below.

3.1 Where Did SNF Reprocessing Occur?

SNF reprocessing could only occur during BPP process steps where the SNF constituent elements existed in solution. That is because the NWPA defines SNF as "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing."

Based on that definition, the reprocessing of SNF in the BPP occurs during the U dissolution and U separation processes[6] as illustrated in Figure 6. The U dissolution and U separation processes are the only points along the BPP flowsheet where all of the constituent elements of the SNF existed in one place. The U dissolution process places the SNF constituent elements (U, Pu, fission products) into solution. All of the constituent elements of SNF exist at that point. The U separations process then selectively precipitates the Pu. All of the SNF constituent elements are present in the mixing tank and in the centrifuge.

Once liquid/solids separations occur in the U separations centrifuge, the SNF constituent elements are separated into waste and Pu product cake. At the completion of the Pu product cake water rinses in the centrifuge, the constituent elements of the SNF have been fully separated and reprocessing is complete. The resultant waste and product streams are as follows:

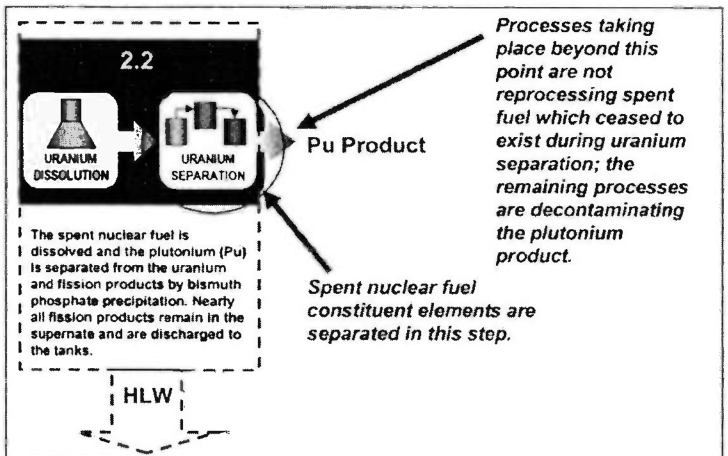


Figure 6. Bismuth Phosphate Reprocessing Processes

- ➢ Uranium Separations Liquid Waste Stream – This waste stream includes ~99.5% (by mass) of all materials present in the SNF prior to dissolution including ~99.5% of the U, ~90% of all fission products including ~99% of the Cs-137 and ~90% of the Sr-90, a small fraction of the Pu, and chemicals/acids used to keep those materials in the liquid phase (CH2M HILL 2002, Johnson 2003), and
- ➢ Plutonium Product Cake – The Pu product cake includes the precipitated Pu, ~0.5% of the U, and ~10% of the fission products, at least half of which are short-lived fission products and daughters (Johnson 2003).

[6] Before uranium dissolution, reprocessing cannot occur since the SF constituent elements could not be separated by reprocessing while still in solid form.

3.2 Which Liquid Wastes Were Produced Directly In Reprocessing?

As described above 'liquid waste produced directly in reprocessing' could only have been created during U dissolution and U separations as those two BPP process steps were the only steps where reprocessing took place. The liquid wastes produced directly in reprocessing were separated from the Pu product by centrifugal action.

The Pu product stream was thoroughly rinsed and centrifuged multiple times to remove all traces of the liquids produced directly in reprocessing (and the undesirable contaminants contained in such liquids) from the Pu cake. By the time the cake was transferred to the first Pu decontamination cycle, any residual liquids produced directly in reprocessing that remained in the cake would have been diluted by ~1000:1 and would have represented <0.1% of the volume of liquid created during U dissolution and U separations[7], a negligible volume and concentration. This, the, leads one to the conclusion that the only 'liquid waste produced directly in reprocessing' from the BPP is the liquid waste stream discharged from the U separations process to the SSTs.

3.3 Which BPP Wastes Are HLW?

For the BPP, it is evident from the preceding discussions that the liquid waste stream discharged from the U separations process contained "highly radioactive material resulting from the reprocessing of spent nuclear fuel". Those wastes therefore meet the definition of HLW set forth in the NWPA[8]:

> "High-level radioactive waste means:
>
> (A) the highly radioactive material resulting from the reprocessing of SNF, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and
>
> (B) other highly radioactive material that the NRC, consistent with existing laws, determines by rule requires permanent isolation."

The U separations liquid waste stream is therefore identified in Figure 6 as HLW. That waste stream contained approximately 95% of the fission products important to DOE in determining the waste disposal pathway, i.e., ~99% of the Cs-137 and ~90% of the Sr-90, the two fission products that, with their secular equilibrium daughters, account for 99% of the radioactivity in the Hanford tanks[9].

---

[7] Cake volume approximately 10 gallons, moisture content ~30%. Waste from U separations approximately 2400 gallons (GE 1951). On that basis, (10)(0.3)/2400 = 0.1% of liquids produced directly in reprocessing should remain in the cake after first liquid/solid separation. Each rinse used 30 gallons of water (GE 1951). Assuming 3 gallons of liquid in the cake (30%) and three separate 30 gallon rinses (including tank rinse), each rinse should reduce the concentration by a factor of 10. Moreover, any such liquid would be highly diluted (by a factor of 1000 due to the three rinses) before the cake was dissolved and transferred.

[8] This same definition is incorporated by reference into the Atomic Energy Act of 1954 (AEA), as amended, and the Waste Isolation Pilot Plant Land Withdrawal Act.

[9] Ba-137m and Y-90 are daughters of Cs-137 and Sr-90, respectively, that are in secular equilibrium, i.e., the half-life of the parent radioisotopes (Cs-137 and Sr-90) is so much longer than that of the daughters that the radioactivity of the daughters is essentially equal to that of the parent.

The liquid wastes produced directly in reprocessing are part of that waste stream and were not present in the BPP Pu-related processes that followed U separations.

Accordingly, wastes from the BPP 1st and 2nd decontamination cycles are not HLW. Similarly, wastes from Pu concentration activities that further processed the product stream from the BPP in 224-B/T buildings were also not HLW.

4.0 TRU DETERMINATION – Candidate Wastes for Classification as Contact-Handled TRU

The WIPP Land Withdrawal Act defines TRU as:

> "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for (A) HLW; (B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or (C) waste that the NRC has approved for disposal on a case-by-case basis in accordance with Part 61 of title 10, Code of Federal Regulations".

The waste streams from the BPP first and second decontamination cycles and the Pu Concentration Cycle that were carried out in the 224-B/T buildings are currently contained in 11 SSTs along with the decladding waste. Based upon the discussions in Section 3, none of those tanks contain HLW as defined in the NWPA.

Fission product concentrations[10] for the wastes in the 11 SSTs are illustrated in Figure 7. The

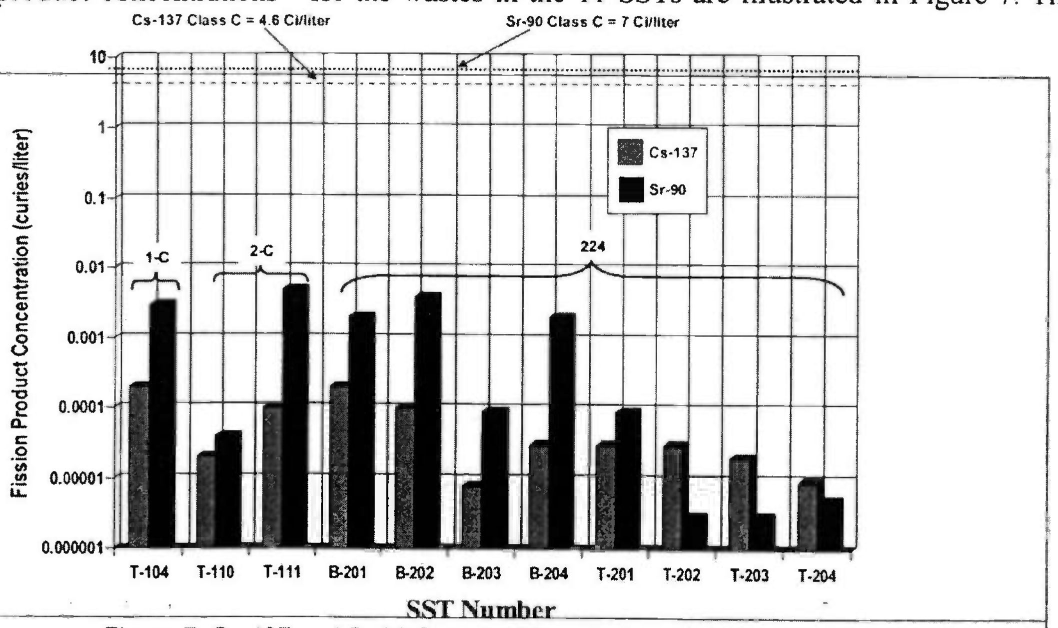


Figure 7. Cs-137 and Sr-90 Concentrations in Candidate TRU Tanks

[10] At the present time, Cs-137 and Sr-90 together with their daughters in secular equilibrium (Ba-137m and Y-90) represent ~99% of the fission product activity in the Hanford tanks (Best Basis Inventory in the Hanford TWINS database).

two dotted/dashed lines near the top of Figure 7 indicate the Class C concentration limits for Cs-137 (4.4 curies per liter) and Sr-90 (7 curies per liter)[11].

All 11 SSTs would be Class A or Class B solely on the basis of the 10 CFR § 61.55 concentrations related to fission products[12]. Based on the fission product content, DOE estimates that all 11 tanks will result in contact-handled[13] TRU once dewatered and packaged. The transuranic material content for each SST is indicated in Figure 8.

The tanks are grouped in Figure 8 according to the primary origin of their contained wastes from within or resulting from the BPP. The first eight tanks are all 200-series, 55,000 gallon, SSTs that contain 224-B/T Pu Concentration Building wastes.

Figure 8. Candidate Contact-Handled Single-Shell Tanks TRU Waste Designation

Tank	Waste Volume (kgal)	Waste Types (See Key Below)	TRU (nanocuries/gm)	Cs-137 (curies/liter)	Sr-90 (curies/liter)
Group I – Single-Shell Tanks Containing 224 Building Waste					
B-201	30	224	824	0.0002	0.002
B-202	29	224	214	0.0001	0.004
B-203	51	224	297	0.000008	0.00009
B-204	50	224	263	0.00003	0.0017
T-201	29	224	754	0.00004	0.0001
T-202	21	224	221	0.00003	0.000003
T-203	37	224	295	0.00002	0.000003
T-204	37	224	243	0.000009	0.000005
Group II – Single-Shell Tanks Containing 224 Building Waste and 2nd Decontamination Cycle Waste					
T-110	370	224/2C	67 (170 after drying)	0.00002	0.00004
T-111	447	224/2C/DW	182	0.0001	0.005
Group III – Single-Shell Tanks Containing 1st Decontamination Cycle Waste					
T-104	317	1C/CW	158	0.0002	0.003

KEY TO WASTE TYPE DESIGNATION

Waste Type	Description
1C	First Pu Decontamination Cycle Waste from Bismuth Phosphate Plant
2C	Second Pu Decontamination Cycle Waste from Bismuth Phosphate Plant
224	224-B/T Plutonium Concentration Building Waste
CW	Coating Removal Waste from Dissolution of the Coating on Spent Nuclear Fuel
DW	Equipment decontamination waste from 221-T Plant

[11] 10 CFR 61.55, Table 2. That regulation indicates the concentrations in curies per cubic meter. The Class C concentrations for Cs-137 and Sr-90 are 4400 curies per cubic meter and 7000 curies per cubic meter, respectively.
[12] The wastes exceed the Table 1 limits in §61.55 for alpha-emitting radionuclides, however, for defense wastes containing alpha-emitting radionuclides, the TRU definition in the WIPP Land Withdrawal Act are governing.
[13] Contact dose at the package surface will be less than 200 mR/hour.

The second group of tanks contain Pu Concentration Building wastes along with wastes from the BPP second decontamination cycle. T-111 also contains decontamination wastes.

The last group has one tank, T-104. It received BPP wastes from coating dissolution and the first decontamination cycle.

DOE has used historical information, sampling, and analysis to determine that the 11 SSTs identified in Figures 7 and 8 are valid candidates to receive a contact-handled TRU designation. That designation will be achieved through a ROD pursuant to the National Environmental Policy Act of 1969.

5.0 REFERENCES

Anderson 1990. "A History of the 200 Area Tank Farms", WHC-MR-0132, J. D. Anderson, Westinghouse Hanford Company, Richland, WA, 1990

ARHCO 1968. "PUREX Chemical Flowsheet Processing Aluminum Clad Uranium Fuels", ARH-214, Atlantic Richfield Hanford Company, Richland, WA, 1968

CH2M HILL 2002. Interoffice Memo from B. Higley, Inventory and Flowsheet Engineering, to J. G. Field, R2-12, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model", 7G300-02-NWK-024, CH2M HILL Hanford Group, Inc., Richland, WA, July 24, 2002.

DuPont 1944. "Hanford Technical Manual", HW-10475-C, Section C, DuPont Company, Richland, WA, 1944

DuPont 1945. "Decontamination of Fission elements in the Separation Process", HW-3-1493, DuPont Company, Richland, WA, 1945

GE 1951. "Flow Sheets and Flow Diagrams of Precipitation Separations Process", HW-23043. General Electric Company, Richland, WA, 1951.

GE 1952. "Hanford Works Monthly Report for July 1952", HW-25227-DEL, pgs Ed-1 through Ed-6, General Electric Company, Richland, WA, 1952.

GE 1955. "Decontamination of Uranium Recovery Process Stored Wastes", Interim Report, HW-36717, General Electric Company, Richland, WA, 1955

GE 1957. "Ultimate Disposal of PUREX Wastes", HW-52824, General Electric Company, Richland, WA, 1957.

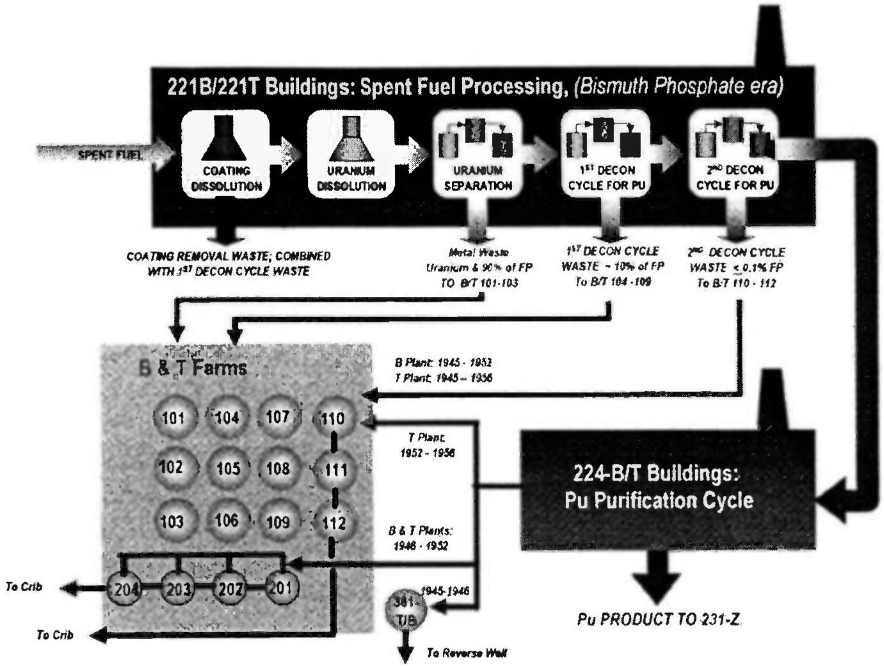
Johnson 2003. "Origin of Wastes in the B-200 and T-200 Series Single-Shell Tanks", M. E. Johnson, RPP-13300, Rev. 0, CH2M HILL Hanford Group, Inc., April 2003.

10 CFR Part 61, Licensing Requirements For Land Disposal Of Radioactive Waste, §61.55, Waste Classification.

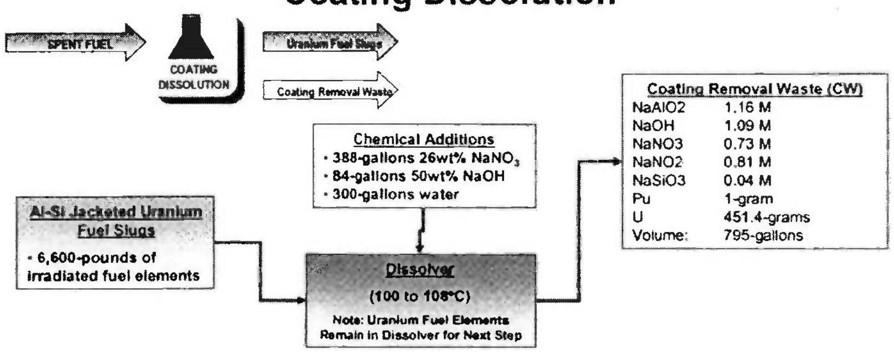
PNNL 1998. "International Waste Management Fact Book", PNNL-11677, Pacific Northwest National Laboratory, Richland, WA, 1998.

Best Basis Inventory (BBI), Tank Waste Information Network System (TWINS), http://twins.pnl.gov/twins.htm

APPENDIX A – Chemical Reactions for the Bismuth Phosphate Flow Sheet



Coating Dissolution

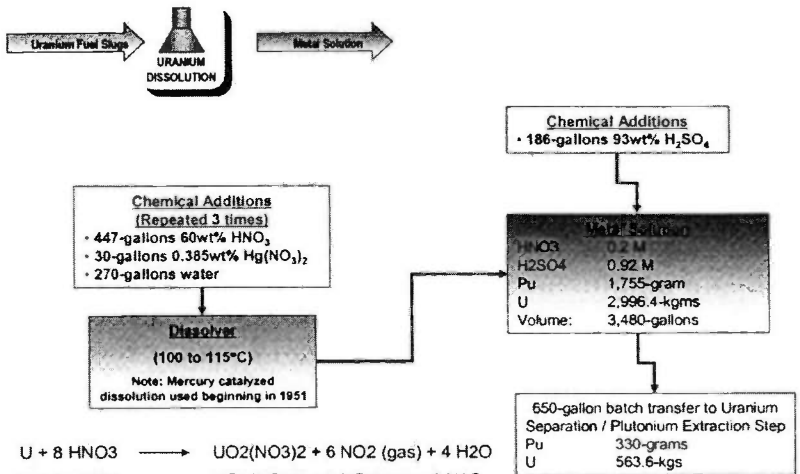


$$2\,Al + 2\,NaOH + 3\,NaNO_3 \longrightarrow 2\,NaAlO_2 + 3\,NaNO_2 + H_2O$$

$$8\,Al + 5\,NaOH + 3\,NaNO_3 + 2\,H_2O \longrightarrow 8\,NaAlO_2 + 3\,NH_3$$

NOTE: The BPP flowsheets in Appendix A were developed by Michael Johnson of CH2MHILL Hanford Group, Inc in December 2003 based upon his review of historical Hanford documents and records as identified at the end of this appendix.

Uranium Dissolution



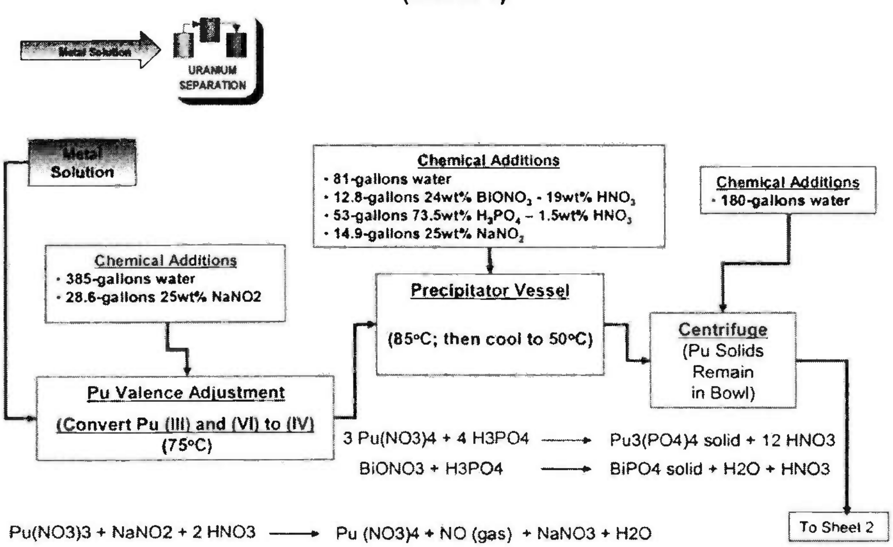
$U + 8\ HNO_3 \longrightarrow UO_2(NO_3)_2 + 6\ NO_2\ (gas) + 4\ H_2O$

$U + 4\ HNO_3 \longrightarrow UO_2(NO_3)_2 + 2\ NO\ (gas) + 2\ H_2O$

$Pu + 8\ HNO_3 \longrightarrow Pu(NO_3)_4 + 4\ NO_2\ (gas) + 4\ H_2O$

Note: Pu is dissolved and forms Pu nitrate in the +3, +4, and +6 valence state

Uranium Separation / Plutonium Extraction
(Sheet 1)



$3\ Pu(NO_3)_4 + 4\ H_3PO_4 \longrightarrow Pu_3(PO_4)_4\ \text{solid} + 12\ HNO_3$

$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4\ \text{solid} + H_2O + HNO_3$

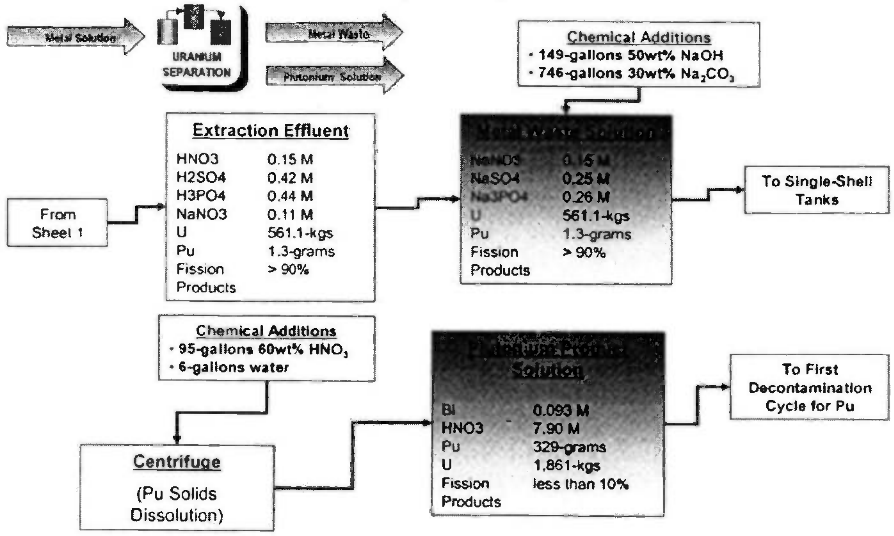
To Sheet 2

$Pu(NO_3)_3 + NaNO_2 + 2\ HNO_3 \longrightarrow Pu\ (NO_3)_4 + NO\ (gas) + NaNO_3 + H_2O$

$PuO_2(NO_3)_2 + NaNO_2 + 2\ HNO_3 \longrightarrow Pu(NO_3)_4 + NaNO_3 + H_2O$

Uranium Separation / Plutonium Extraction

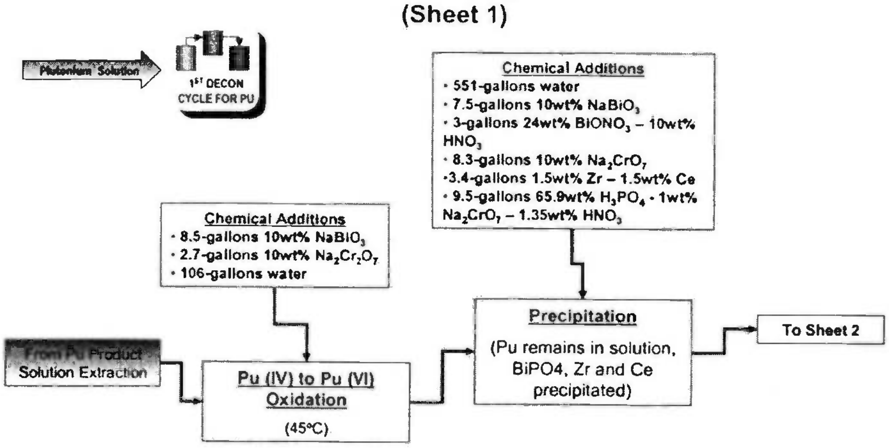
(Sheet 2)



Pu3(PO4)4 + BiPO4 + 15 HNO3 (conc.) ⟶ 3Pu (NO3)4 + Bi(NO3)3 + 5 H3PO4

First Decontamination Cycle for Plutonium

(Sheet 1)



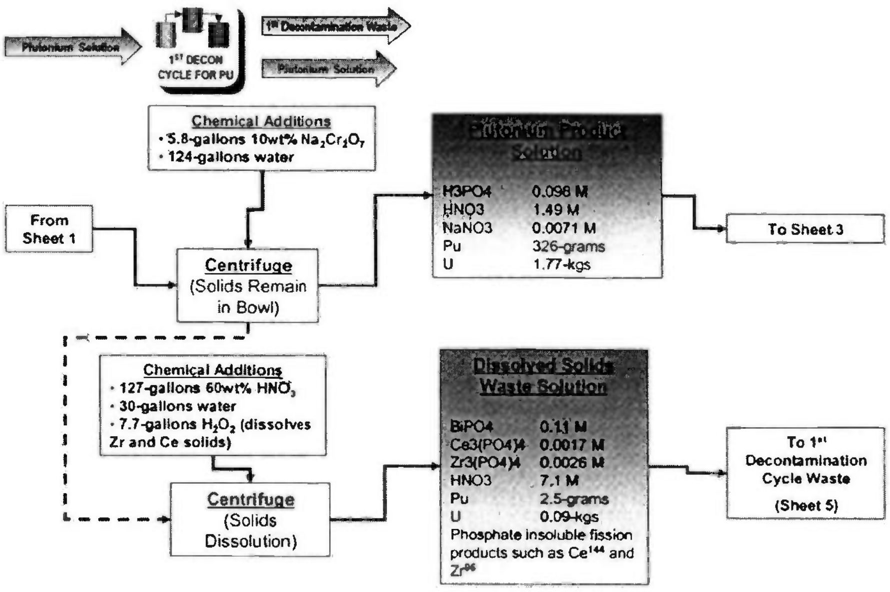
Pu(NO3)4 + NaBiO3 ⟶ PuO2(NO3)2 + BiONO3 + NaNO3

BiONO3 + H3PO4 ⟶ BiPO4 (solid) + HNO3 + H2O

Chemical Reactions for the Bismuth Phosphate Flow Sheet

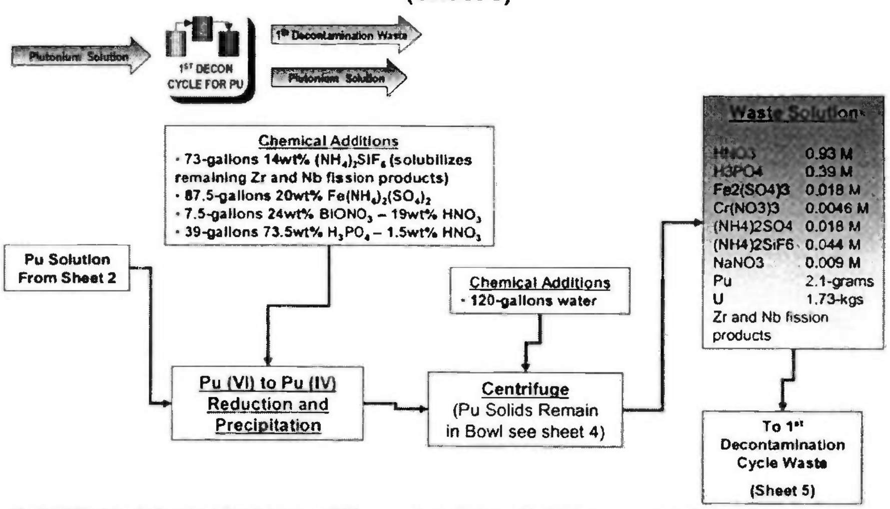
First Decontamination Cycle for Plutonium

(Sheet 2)



First Decontamination Cycle for Plutonium

(Sheet 3)



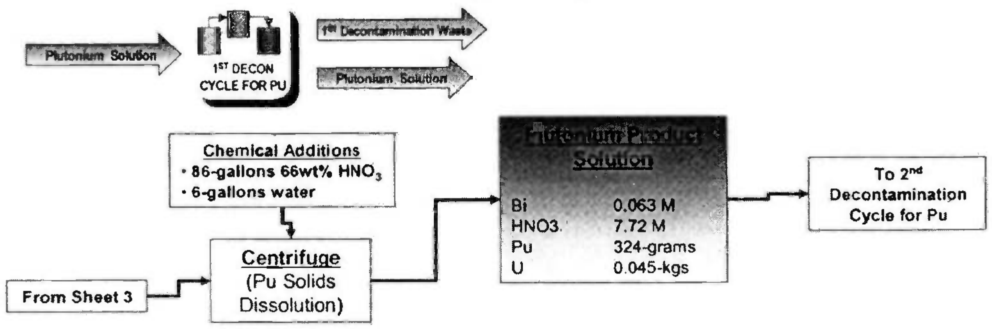
$PuO_2(NO_3)_2 + 2\ Fe(NH_4)_2(SO_4)_2 + 4\ HNO_3 \longrightarrow Pu(NO_3)_4 + Fe_2(SO_4)_3 + 2\ NH_4NO_3 + (NH_4)_2SO_4$

$3\ Pu(NO_3)_4 + 4\ H_3PO_4 \longrightarrow Pu_3(PO_4)_4$ solid $+ 12\ HNO_3$

$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4$ solid $+ H_2O + HNO_3$

First Decontamination Cycle for Plutonium

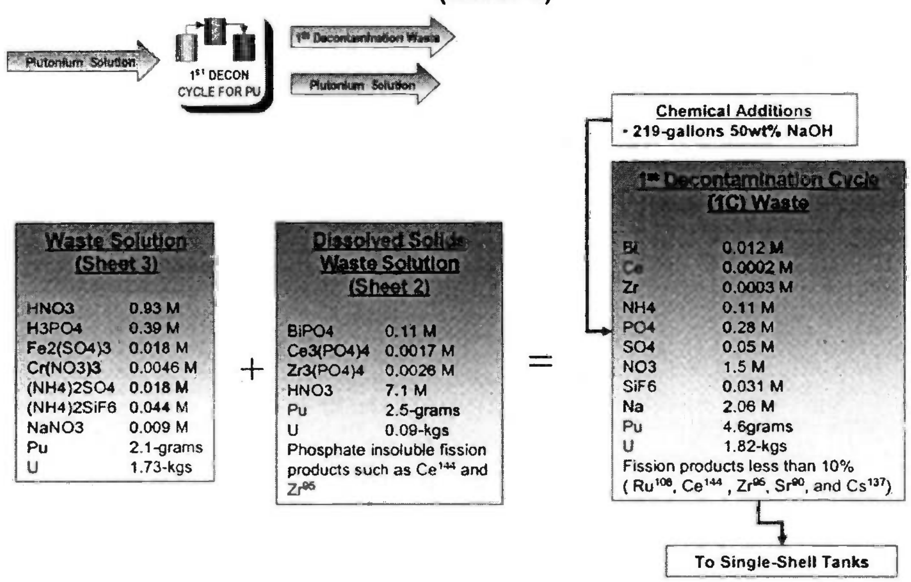
(Sheet 4)



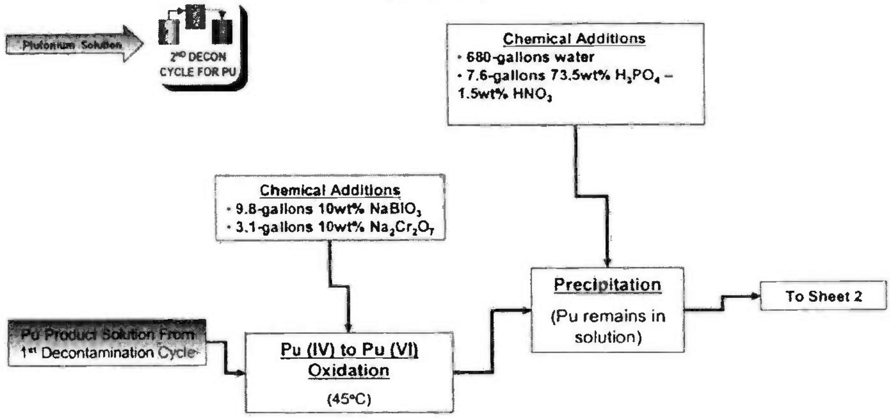
$$Pu_3(PO_4)_4 + BiPO_4 + 15\ HNO_3\ (conc.) \longrightarrow 3Pu(NO_3)_4 + Bi(NO_3)_3 + 5\ H_3PO_4$$

First Decontamination Cycle for Plutonium

(Sheet 5)



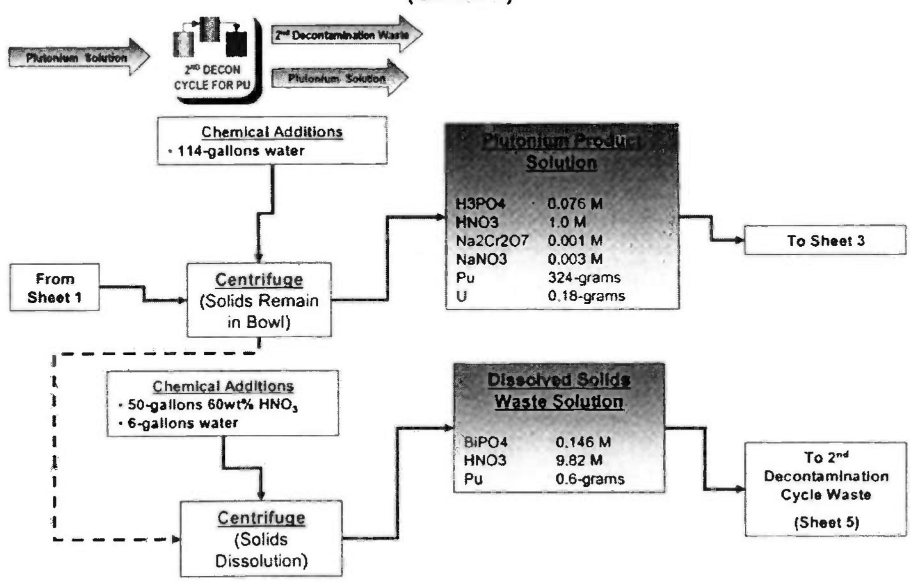
Second Decontamination Cycle for Plutonium
(Sheet 1)



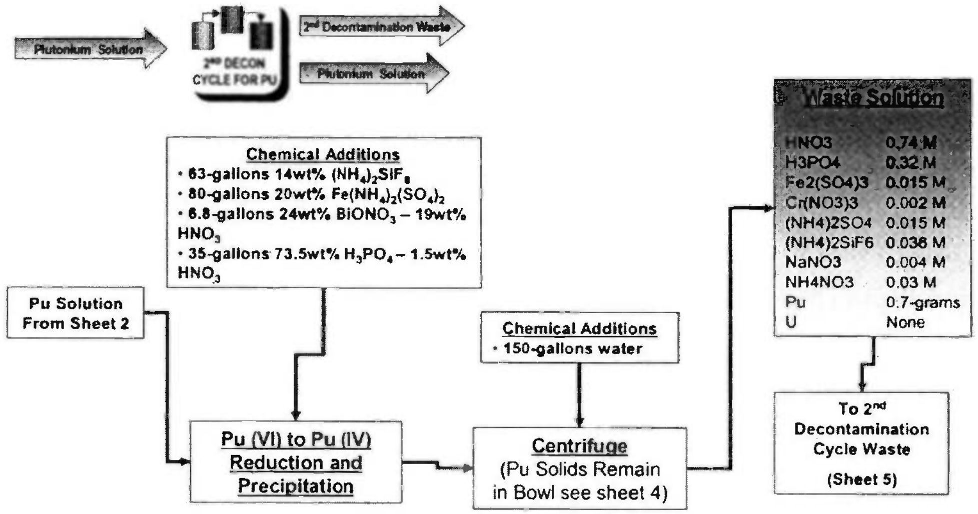
Pu(NO3)4 + NaBIO3 ⟶ PuO2(NO3)2 + BiONO3 + NaNO3

BiONO3 + H3PO4 ⟶ BiPO4 (solid) + HNO3 + H2O

Second Decontamination Cycle for Plutonium
(Sheet 2)



Second Decontamination Cycle for Plutonium
(Sheet 3)

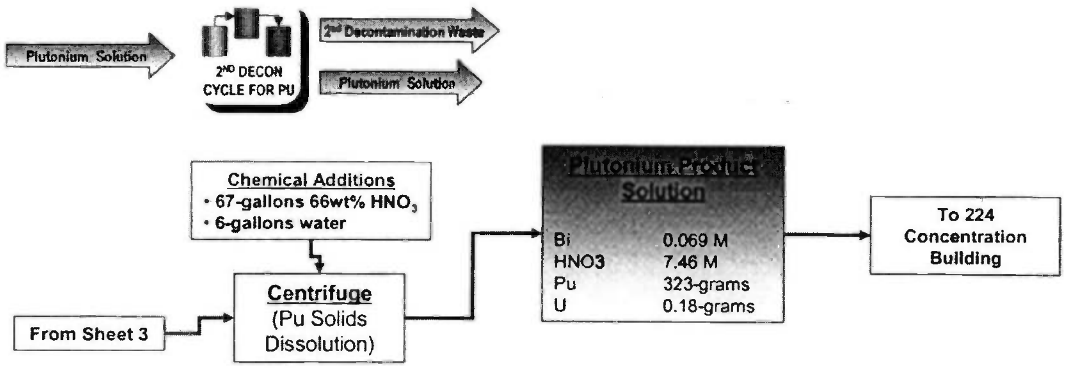


$$PuO_2(NO_3)_2 + 2\ Fe(NH_4)_2(SO_4)_2 + 4\ HNO_3 \longrightarrow Pu(NO_3)_4 + Fe_2(SO_4)_3 + 2\ NH_4NO_3 + (NH_4)_2SO_4$$

$$3\ Pu(NO_3)_4 + 4\ H_3PO_4 \longrightarrow Pu_3(PO_4)_4 \text{ solid} + 12\ HNO_3$$

$$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4 \text{ solid} + H_2O + HNO_3$$

Second Decontamination Cycle for Plutonium
(Sheet 4)



$$Pu_3(PO_4)_4 + BiPO_4 + 15\ HNO_3 \text{ (conc.)} \longrightarrow 3Pu(NO_3)_4 + Bi(NO_3)_3 + 5\ H_3PO_4$$

Second Decontamination Cycle for Plutonium

(Sheet 5)

Dissolved Solids Waste Solution (Sheet 2)	
BiPO4	0.146 M
HNO3	9.82 M
Pu	0.6-grams

+

Waste Solution (Sheet 3)	
HNO3	0.74 M
H3PO4	0.32 M
Fe2(SO4)3	0.015 M
Cr(NO3)3	0.002 M
(NH4)2SO4	0.015 M
(NH4)2SiF6	0.036 M
NaNO3	0.004 M
NH4NO3	0.03 M
Pu	0.7-grams
U	None

=

Chemical Additions
- 174-gallons 50wt% NaOH

2nd Decontamination Cycle (2C) Waste	
Bi	0.006 M
Fe	0.033 M
Cr	0.001 M
NH4	0.095 M
PO4	0.24 M
SO4	0.038 M
SiF6	0.026 M
NO3	0.99 M
Na	1.60 M
Pu	1.3-grams

Fission products less than 0.1%
(Ru^{106}, Ce^{144}, Zr^{95}, Sr^{90}, and Cs^{137})

→ To Single-Shell Tanks

Bismuth Phosphate Cross-Over: Pu (IV) to Pu (VI) Oxidation

From 221 Plant 2nd Decontamination Cycle for Pu

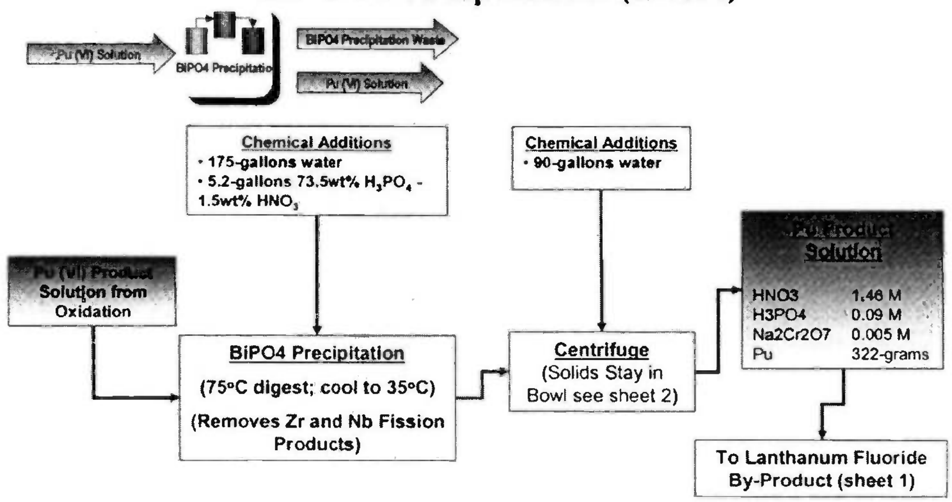
Plutonium Solution	
BiPO4	0.069 M
HNO3	7.46 M
Pu	323-grams
U	0.18-grams

Chemical Additions
- 96-gallons water
- 32.8-gallons 3.9wt% $NaBiO_3$ - 1.4wt% $Na_2Cr_2O_7$

→ **Pu (IV) to Pu (VI) Oxidation** (45°C) → **Pu (VI) Product Solution to BIPO4 Precipitation**

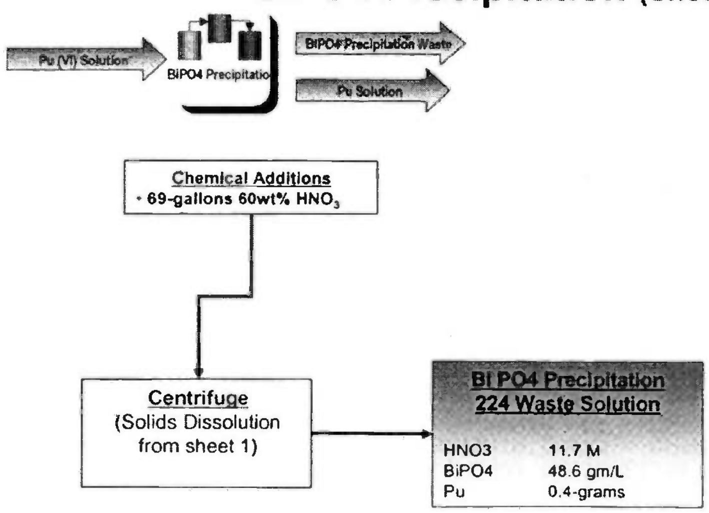
$$Pu(NO_3)_4 + NaBiO_3 \longrightarrow PuO_2(NO_3)_2 + BiONO_3 + NaNO_3$$

Bismuth Phosphate Cross-Over: BiPO4 Precipitation (Sheet 1)

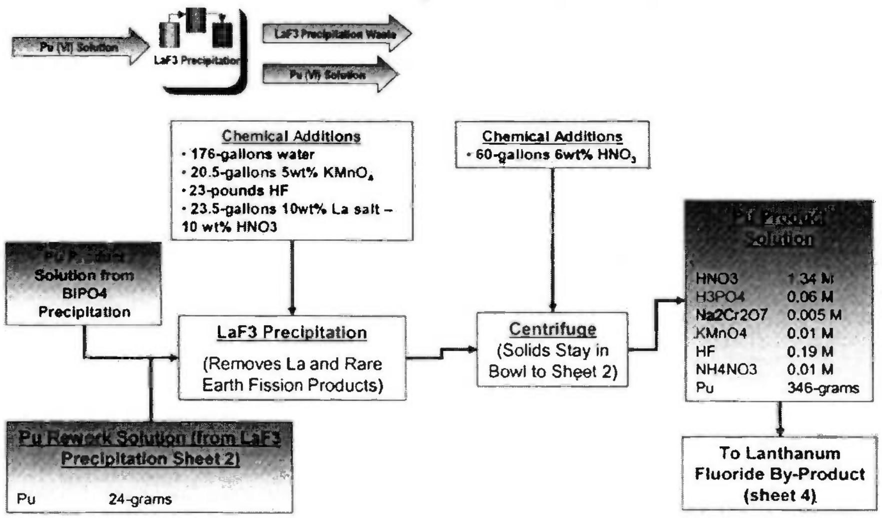


BiONO3 + H3PO4 ⟶ BiPO4 solid + HNO3 + H2O

Bismuth Phosphate Cross-Over: BiPO4 Precipitation (Sheet 2)

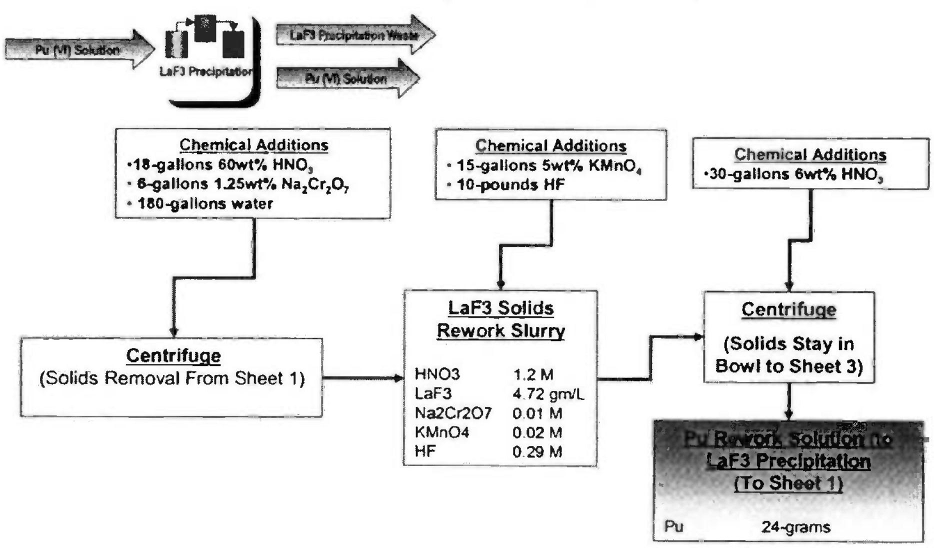


Lanthanum Fluoride By-Product: LaF3 Precipitation (Sheet 1)

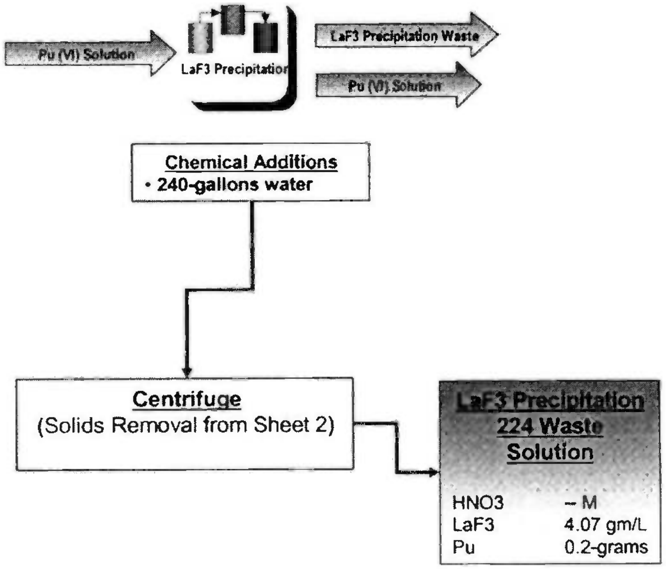


La(NH4)2(NO3)5 + 3 HF → LaF3 + 2NH4NO3 + 3 HNO3

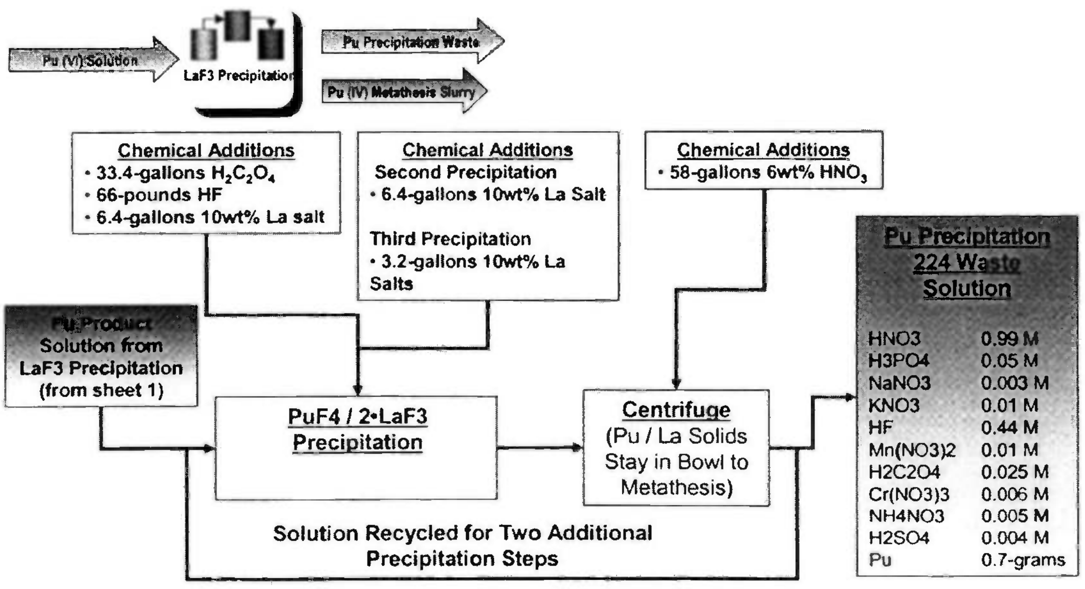
Lanthanum Fluoride By-Product: LaF3 Precipitation (Sheet 2)



Lanthanum Fluoride By-Product: LaF3 Precipitation (Sheet 3)



Lanthanum Fluoride By-Product: Pu (VI) to Pu (IV) Reduction and Precipitation (sheet 4)

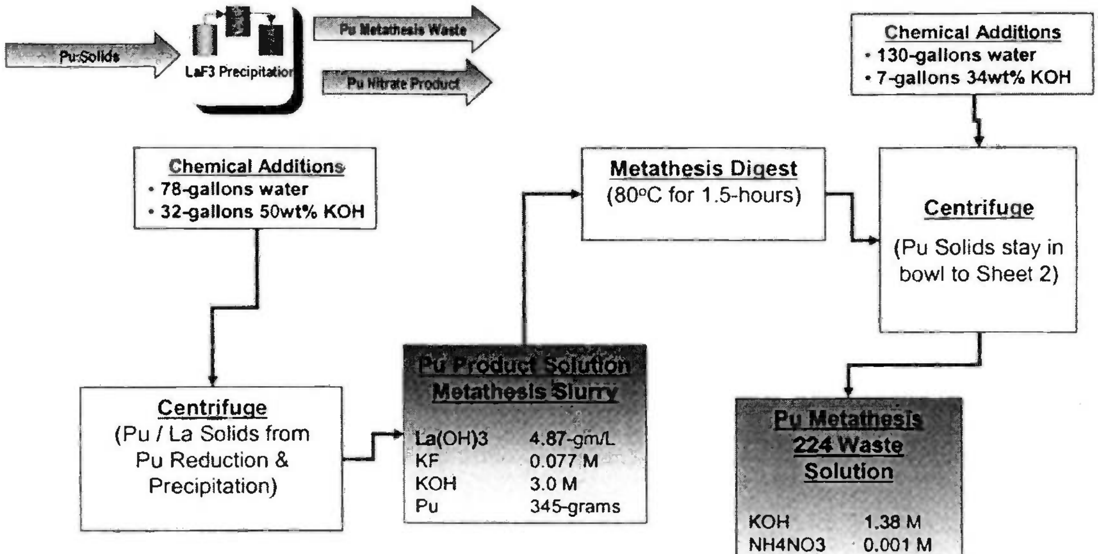


$$2\,HNO_3 + H_2C_2O_4 + PuO_2(NO_3)_2 \longrightarrow Pu(NO_3)_4 + CO_2\,(gas) + 2\,H_2O$$

$$Pu(NO_3)_4 + 4\,HF \longrightarrow PuF_4 + 4\,HNO_3$$

$$2\,La(NH_4)_2(NO_3)_5 + 6\,HF \longrightarrow 2\,LaF_3 + 6\,HNO_3 + 4\,NH_4NO_3$$

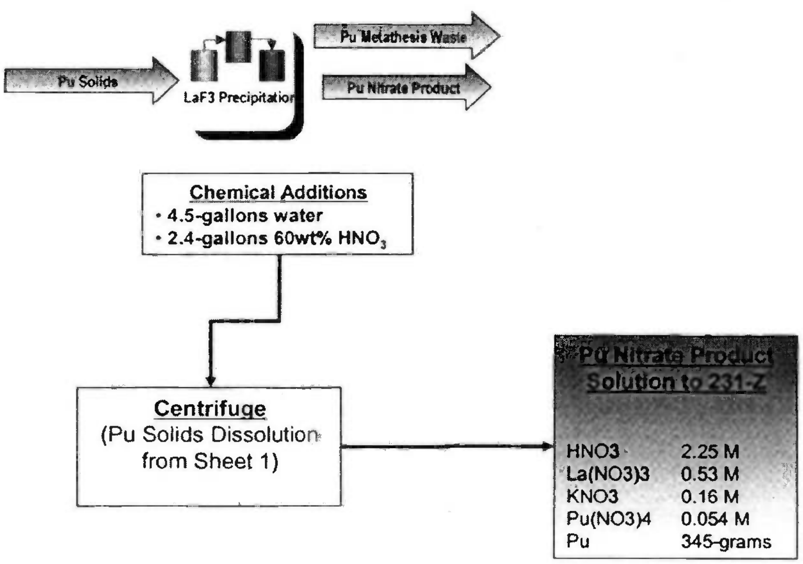
Plutonium Metathesis (Sheet 1)



PuF_4 solid + 4 KOH $\longrightarrow$ $Pu(OH)_4$ solid + 4 KF

2 LaF_3 solid + 6 KOH $\longrightarrow$ 2 $La(OH)_3$ solid + 6 KF

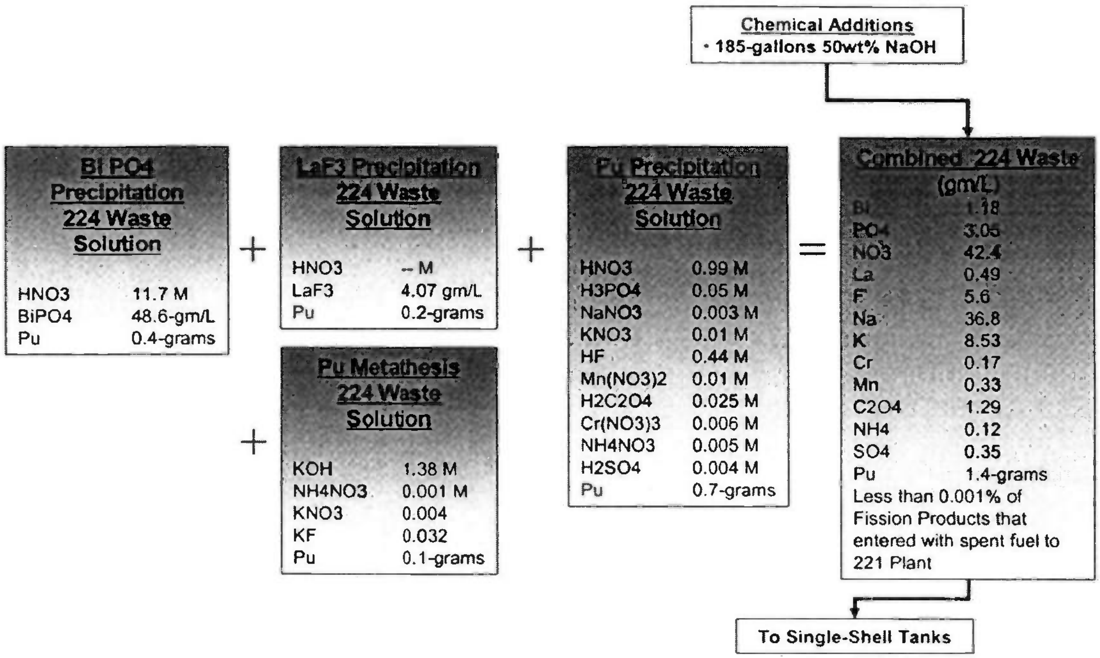
Plutonium Metathesis (Sheet 2)



$Pu(OH)_4$ solid + 4 HNO_3 $\longrightarrow$ $Pu(NO_3)_4$ + 4 H_2O

$La(OH)_3$ solid + 3 HNO_3 $\longrightarrow$ $La(NO_3)_3$ + 3 H_2O

224 Building Waste



References for Appendix A Flowsheets:

HW-10475-C, 1944, *Hanford Technical Manual Section C*, General Electric Hanford Atomic Products Operation, Richland, Washington

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington

HW-26365, 1952, *Brief Summary of Separations Processes*, General Electric Company, Richland, Washington

APPENDIX B – Bismuth Phosphate and PUREX Process Waste Stream Characteristics

Table B-1. Comparison of Bismuth Phosphate and PUREX Process Waste Streams

Waste Stream	Gross Beta Radioactivity µCi/ml	Gross Gamma Radioactivity µCi/ml	Sr-90 µCi/ml	Cs-137 µCi/ml	Waste Batch Volume (gallons)[14]	Waste Batch (gallons / U Ton	Comment
221-T / 221-T Bismuth Phosphate Plant and 224-T / 224-B Pu Concentration Processing Wastes							
Uranium Separations Metal Waste	127	22	Not Reported	Not Reported	2380	3840	Average of three samples taken in 1947. Fission products in Metal waste had decayed for 1 to 2 years; see Table B-2.
Uranium Separations Metal Waste	Not Reported	Not Reported	0.59	57.3	Not Reported		Average Cs and Sr concentrations in Metal waste after U removal in the TBP Plant; see Table B-3
First Pu Product Decontamination Cycle (1C) Waste mixed with Coating Removal Waste (CW)	0.39	0.22	0.0058	0.15	2822	4551	Average fission products concentrations in 1C/CW waste; see Table B-3.
Second Pu Product Decontamination Cycle (2C) Waste	0.0018	0.003	Not Reported	Not Reported	2090	3370	Average fission products concentrations in 2C waste; see Table B-2
224 Pu Product Concentration Building Waste	0.14	0.03	Not Reported	Not Reported	2200	3550	See HW-10728, page 9, 1948, *Process Waste Data – 200 Areas*, Letter from R. S. Bell to file dated August 12, 1948, General Electric Company, Richland Washington
PUREX First Cycle Raffinate							
Waste Stream	**Gross Beta Radioactivity µCi/ml**	**Gross Gamma Radioactivity µCi/ml**	**Sr-90 µCi/ml**	**Cs-137 µCi/ml**	**Waste Batch Volume (gallons)**	**Waste Batch (gallons / U Ton**	**Comment**
PUREX 1WW (concentrated aqueous waste from 1st cycle solvent extraction *before concentration and neutralization; after 1-year decay*)	Not Reported	Not Reported	5,300	5,100	100	100	HW-52824, page 7, 1957, *Ultimate Disposal of PUREX Wastes*, General Electric Company, Richland Washington. (1957 PUREX Flowsheet for processing 600 MWD / ton natural U fuel)
PUREX 1WW (concentrated aqueous waste from 1st cycle solvent extraction *after sugar denitration, concentration and neutralization*)	Not Reported	Not Reported	~ 218,800 (includes Sr^{89} and Sr^{90})	~12,700	657.4 (assuming 16-tons Uranium processed per batch)	41.1	ARH-214, 1968, PUREX Chemical Flowsheet Processing Aluminum Clad Uranium Fuels, Atlantic Richfield Hanford Company, Richland Washington. (1968 PUREX Flowsheet for processing 600 MWD/ton natural U fuel; includes internal recycle of wastes and sugar denitration of 1WW)

[14] Bismuth Phosphate Process waste volumes are from HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington

Table B-2. Analyses of Bismuth Phosphate Process Supernatant

Waste Type[1,2]	Tank	Date Filled	pH	Pu μGm/liter	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101		10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	08/1945	10	35	110	25	7-01-1947
Metal Waste	T-102	11/1945	9.9	60	120	20	7-01-1947
Metal Waste	T-103	02/1946	9.8	60	150	20	7-01-1947
	Average for three samples taken in 1947			51.7	126.7	21.7	
1C/CW	B-109	04/1946	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	04/1947	9.9	12	12	4.4	3-18-1947
2C[4]	B-111	04/1946	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	08/1946	6.8	4.32E?? [3]	1.5E-03	3.0E-03	7-1-1947

Notes:
[1] See HW-10728, 1948, *Process Waste Data – 200 Areas*, Letter from R. S. Bell to file dated August 12, 1948, General Electric Company, Richland Washington and HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland Washington.
[2] Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.
[3] The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.
[4] Prior to October 1945, the 2C waste was neutralized to a pH of approximately 10. The waste collected in tanks 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).
[5] Reduction in the gross gamma and beta analyses for the metal waste in tank T-101 from sampling in 12-12-1946 to 07-01-1947 is due to decay of short-lived fission products.

Table B-3. Radionuclide Analyses of Metal Waste and First Decontamination Cycle Waste

Tank	Date Filled	Pu µgm/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y – Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle Waste Mixed with Coating Removal Waste Supernatant [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.012	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.012		0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037		0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.006	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.0058**	**0.15**						

Notes:
[1] HW-36717, Decontamination of Uranium Recovery Process Stored Wastes Interim Report, May 16, 1955, W. W. Schulz, General Electric Company, Richland Washington.
[2] HW-20195, Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants, February 5, 1951, General Electric Company, Richland Washington.
[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

DISTRIBUTION LIST **DOE/ORP-2004-01**

ORP
L. Erickson
H. B. Gnann
R. W. Lober
D. L. Noyes
R. A. Quintero
R. J. Schepens
S. D. Stubblebine
J. H. Swailes
S. A. Wiegman
R. M. Yasek
Central Files, B1-07
DOE Reading Room, H2-53
DPC, H6-08
Hanford Tech. Library, P8-55

DOE-EM
G. W. Cunningham, EM-1
I. R. Triay, EM-3
K. C. Guevara, EM-22

CH2M HILL
D. I. Allen
J. O. Honeyman
M. N. Jarayssi
M. E. Johnson
A. J. Knepp
J. G. Kristofzski
F. R. Miera
R. S. Popielarczyk
T. L. Sams

Other
Mark B.Triplett, PNL
William M Hewitt, YAH
Donald D. Wodrich, YAH
Katherine Yuracko, YAH

RECEIVED
FEB 26 2004
DOE-ORP/ORPCC

Basis for Designating Certain Hanford Single-Shell Tank Wastes Resulting From the Bismuth-Phosphate Process as TRU

Prepared by YAHSGS LLC, Richland, WA
under Contract ORP-YAH001 to the
Project Assistance Corporation in Support of the
Department of Energy, Office of River Protection

January 2004

Preface

Although historically the Department of Energy (DOE) has managed wastes within the Hanford tank farms as high-level radioactive wastes (HLW) as a matter of operations management policy, DOE has long maintained that, based on origin, process history, and radiological characteristics, the wastes in any specific tank may actually be HLW, transuranic waste (TRU), or mixed low-level waste (MLLW). DOE, therefore, has planned to appropriately designate wastes into one of those categories once the wastes are ready for retrieval for treatment and disposal.

Accordingly, the DOE Office of River Protection (ORP) identified 11 single-shell tanks (SSTs) that contain wastes from the Bismuth-Phosphate Process (BPP). The BPP, the first production-scale spent nuclear fuel (SF) reprocessing process ever used, was deployed during the Manhattan Project (World War II) to separate plutonium from SF. The BPP was only used at Hanford and was replaced 50 years ago by more efficient solvent extraction reprocessing processes, i.e., REDOX and PUREX. An important feature of the BPP relative to waste designation is that it was a batch process, a feature that allows ORP to clearly distinguish where SF existed (or did not exist) within the process. The BPP used chemical additions to selectively dissolve and precipitate plutonium compounds so that the plutonium could be separated from other SF constituents by liquid/solids separations via centrifugation. Multiple water washes each followed by centrifugation ensured very high degrees of solids separation from process liquids, e.g., separation of plutonium precipitates from liquids produced directly in SF reprocessing.

The BPP created HLW that will be treated in the Waste Treatment Plant currently under construction at Hanford and subsequently disposed of in the national repository. The BPP also produced waste streams that are not HLW by origin as those wastes were not produced during the reprocessing of SF. The fact that the wastes are not HLW is confirmed by waste fission product concentrations that are orders of magnitude less than those the U.S. Nuclear Regulatory Commission requires to be disposed of in a geologic repository (10 CFR Part 61, Low-Level Radioactive Waste Disposal).

This document explains the BPP and identifies which BPP steps produced HLW and which did not on the basis of where SF reprocessing actually took place within the series of BPP batch treatment steps. As a result, this document provides a technical and regulatory basis for DOE-ORP to determine that wastes from the BPP that are now contained in 11 Hanford SSTs (B-201, B-202, B-203, B-204, T-201, T-202, T-203, T-204, T-104, T-110, and T-111) are TRU due to waste origin and confirmed by radionuclide content. This document was developed in full consideration of extensive technical evaluations of historical BPP and tank farm source documents and records that were performed by the current Hanford tank farm contractor, CH2M HILL Hanford Group, Inc. CH2M HILL's evaluations included historical records and process information produced by Hanford site contractors that operated the BPP over its 1945–1954 operating history. Information derived from those historical documents is consistent with the radioactive and chemical characteristics of the wastes in the 11 SSTs. Accordingly, this document is believed to provide a reasonable and sound basis to support a DOE-ORP determination that the wastes in the 11 SSTs identified above are TRU. Once those wastes are put into a suitable form for disposal, appropriately packaged, and characterized in a manner that conforms to the Waste Isolation Pilot Plant (WIPP) waste acceptance criteria and permit requirements, those wastes should be suitable for disposal of at WIPP.

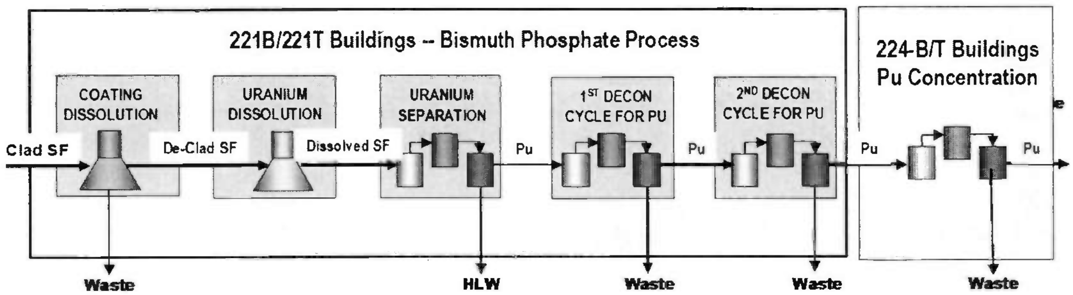
Table of Contents

Preface i
Table of Contents ii
Executive Summary iii
Basis for Designating Certain Hanford Tank Wastes as TRU 1
1.0 BACKGROUND – Hanford Wastes Vary Significantly Tank-to-Tank 1
2.0 BISMUTH PHOSPHATE PROCESS 3
2.1 Coating Dissolution (Decladding – Figure 4, Block 2.1) 4
2.2 Uranium Dissolution and Uranium Separation (Figure 4, Block 2.2) 4
2.3 Plutonium Decontamination (Figure 4, Block 2.3, 1st and 2nd Decon Cycles) 5
2.4 Plutonium Concentration Building (224-B/T) Wastes (Figure 4, Block 2.4) 5
3.0 CLASSIFICATION OF TANK WASTES FROM THE BISMUTH PHOSPHATE PROCESS 6
3.1 Where Did Spent Nuclear Fuel Reprocessing Occur? 7
3.2 Which Liquid Wastes Were Produced Directly In Reprocessing? 8
3.3 Which BPP Wastes Are HLW? 8
5.0 REFERENCES 12
APPENDIX A – Chemical Reactions for the Bismuth Phosphate Flow Sheet 1
APPENDIX B – Bismuth Phosphate and PUREX Process Waste Stream Characteristics 1

Executive Summary

A diversity of Hanford's tank waste generation operations over the past 60 years has led to large tank-to-tank differences in radioactive material concentrations. Understanding how and why these differences occurred is important to reaching sound waste management decisions. Of particular interest are wastes generated from the Bismuth Phosphate Process (BPP), the first ever spent nuclear fuel (SF) reprocessing and plutonium (Pu) recovery process. That is, in part, because wastes generated by several BPP process steps are candidates for a transuranic waste (TRU) determination as illustrated and discussed below.

The BPP, unlike later Hanford solvent extraction-based reprocessing approaches (i.e., REDOX and PUREX), consisted of a series of individual batch processes which selectively dissolved and precipitated specific materials to recover Pu. It achieved thorough liquid/solids separation via centrifugation and multiple water rinses of the centrifuge solids cake, thereby removing liquids and soluble materials from the cake. Each batch process step resulted in an extensive and selective separation of the process wastes from the process product streams. As a result, out of the five distinct BPP process steps (coating dissolution, U dissolution, U separation, 1st decontamination cycle for Pu, 2nd decontamination cycle for Pu,), only two involved SF reprocessing: U dissolution and U separations.



The coating removal process did not create high-level waste (HLW) because it only dissolved the aluminum coating leaving the SF intact. That process did not dissolve SF and its wastes were mildly contaminated.

High-level waste (HLW) including all liquids produced directly in the reprocessing of SF existed only within the U dissolution and U separation processes. Acids introduced during U dissolution dissolved the SF, placing the Pu, the U, and all of the fission products in solution. The U separation processes then selectively precipitated the Pu, leaving the U and fission products in solution.

The liquid waste from U separations contained over 99.5% of the SF constituent elements including >99.5% of the U, ~99% of the Cs-137, and ~90% of the Sr-90 (DuPont 1944). The liquid and solid wastes produced during U dissolution and U separation therefore fall squarely within the definition of HLW as set forth in the Nuclear Waste Policy Act of 1982 (NWPA). The extensive liquid/solids separations and multiple rinses conducted during U separations assured that any liquid wastes produced directly in reprocessing were discharged as liquid wastes and did not follow the Pu precipitate into the 1st or 2nd decontamination cycles or beyond.

The Pu precipitate, once triple rinsed, contained >99.5% of the Pu, <0.5% of the U, and ~10% of the fission products. At least half of the fission products were short-lived isotopes that decayed to deminimis levels within 1-2 years. Because the SF constituent elements were separated during U separations, no SF was present in the subsequent decontamination cycles. Accordingly, wastes from the 1st and 2nd decontamination cycles and Pu concentration process are not HLW based on the NWPA HLW definition. The low fission product concentrations in those wastes is consistent with a non-HLW designation. It is therefore DOE's position that, on the basis of origin and content, the wastes in the 11 SSTs that received the wastes from coating removal, the 1st and 2nd decontamination cycles, and Pu concentration (T-104, T-110, T-111, B-201 through B-204, T-201 through T-204) are not HLW.

Moreover, the wastes in those 11 SSTs meet the definition of transuranic waste set forth in the NWPA and the Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act of 1996 and are, therefore, candidates for disposal at WIPP in New Mexico. DOE's formal determination that the wastes are TRU would occur via Record of Decision (ROD) in accordance with the National Environmental Policy Act of 1969 (NEPA). Based on that ROD, the wastes would be retrieved, dewatered, packaged, certified, and then disposed of as TRU at WIPP. Once dewatered and packaged, wastes from all 11 SSTs will be contact-handled, exhibiting package surface dose rate less than 200 mR/hour.

Basis for Designating Certain Hanford Tank Wastes as TRU

1.0 BACKGROUND – Hanford Wastes Vary Significantly Tank-to-Tank

Hanford's 149 single-shell tanks (SSTs), 28 double-shell tanks (DSTs), and 60 miscellaneous underground storage tanks (MUSTs) collectively store ~54 million gallons of radioactive mixed defense wastes containing ~190 million curies of radioactivity. The wastes in those tanks have varying origins. For example, although extensive spent nuclear fuel (SF) reprocessing operations were conducted at Hanford, not all tank wastes originated during the reprocessing of SF. Tank wastes were produced by a number of Hanford defense-related operations associated with removing cladding from SF, purifying the plutonium (Pu) product, decontaminating equipment/facilities, and performing laboratory analyses. Rather than being the actual reprocessing of SF, these operations occurred prior to, following, or incidental to SF reprocessing. Such diversity in Hanford's tank waste generation operations resulted in large tank-to-tank radioactive material concentration differences. Understanding these differences is important to sound waste management decisionmaking. The magnitude of the large tank-to-tank radionuclide concentration differences are graphically and numerically illustrated in Figures 1 and 2, respectively. For example, the five tanks[1] with the highest inventories of radioactive materials in Figure 1 collectively contain ~ 50 million curies whereas the 10 tanks[2] with the lowest radioactive material inventories collectively contain less than 5 thousand curies; this is a factor of 10,000 difference. Furthermore, specific radionuclide concentrations can vary by factors greater than 1 million from tank-to-tank as illustrated in Figure 2 for Cs-137 and Sr-90, the two most prominent radionuclides in the tanks.

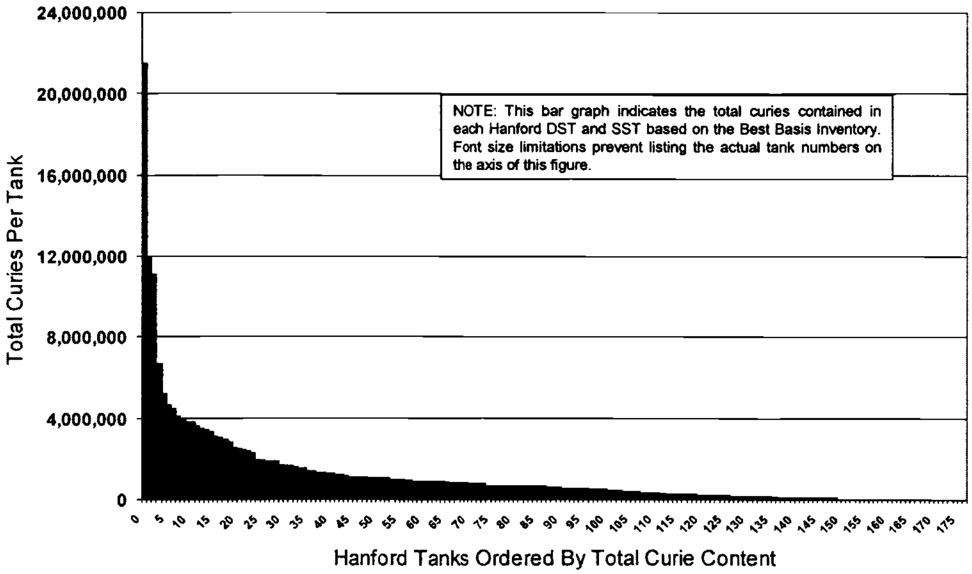


Figure 1. Radionuclide Inventories in the Hanford Tanks Span Over Four Orders of Magnitude

[1] In order of curie inventory, high to low, the tanks are AZ-101, AZ-102, AY-102, A-105, and AX-104.
[2] Not ordered by curie inventory, the tanks are B-201, -202, -203. -204; T-201, -202, -203, - 204; and U-203 and U-204.

Source: Best Basis Inventory in the TWINS Database

There are several reasons why there is such a wide range of fission product inventories in the Hanford tanks. First, while some tanks received highly radioactive wastes produced during the reprocessing of spent nuclear fuel, other tanks did not. Second, the Bismuth Phosphate Process (BPP), the world's first production-level reprocessing process which was carried out at Hanford during the Manhattan Project starting in 1944, created large quantities of relatively low-curie waste compared to the waste produced by later, substantially more efficient processes such as REDOX and PUREX. Third, a 1960s/70s Hanford tank waste campaign extracted large amounts of Cs-137 from liquids in most Hanford tanks and Sr-90 from wastes in the A and AX farm tanks. That campaign reduced the collective Hanford tank farms' fission product content by approximately 40%[3]. Fourth, tank capacities vary from 55,000 gallons to over 1 million gallons and tanks are filled to varying degrees.

	Cs-137		Sr-90	
	(Ci/liter)	Tank	(Ci/liter)	Tank
Highest Concentration	~1.9	AX-104	~79	AX-104
Lowest Concentration	0.00001	T-204	<0.000003	T-202
Ratio (High/Low)	200,000		30,000,000	

Figure 2. Highest and Lowest Cs-137 and Sr-90 Concentrations in Hanford Tanks
Source: Best Basis Inventory in Hanford TWINS Database

This variability in waste sources and concentrations has led the Department of Energy (DOE) to consider the origin and the characteristics of wastes in each tank in planning its treatment and disposal strategies. Some examples of wastes discharged to tanks that did not originate directly during the reprocessing of spent nuclear fuel include:

- Decladding wastes resulting from dissolving the metallic cladding (coating) from the spent nuclear fuel in order to expose the actual fuel to reprocessing acids.
- Wastes from processes used to clean and/or concentrate recovered Pu product materials in order to achieve requisite Pu purity levels for weapons use.
- Laboratory wastes resulting from the sampling and analysis of various process and waste streams resulting from Hanford operations.
- Wastes from the cleanup of contaminated facilities and/or equipment.

Regardless of the characteristics or origin of the waste in any given tank, as a matter of policy, DOE manages the Hanford tank farm wastes as high-level radioactive wastes (HLW) while those wastes are stored in the tanks. This does not mean that DOE classified the wastes as HLW but rather, that DOE employs an appropriately conservative management practice to ensure that the highest levels of safety and best management practices are in place during the storage, retrieval, and handling of the Hanford tank farm wastes.

[3] The cesium and strontium were converted to cesium chloride and strontium fluoride and encapsulated. The campaign was undertaken to reduce the decay heat load on the tanks, however, beneficial uses for the capsules were sought and many capsules were deployed on commercial and government initiatives.

In the sections that follow, the BPP is described with a focus on determining (a) when SF was present such that the "reprocessing of spent nuclear fuel" actually occurred in a process, (b) which BPP processes created "liquid waste produced directly in reprocessing [of SF]", and (c) which BPP processes appear to have resulted in solid materials with "fission products in sufficient concentrations" to warrant permanent isolation. The BPP is compared and contrasted as appropriate with the PUREX process for the simple reason that most people think of the PUREX process when they think of reprocessing. PUREX was used across the DOE weapons complex for Pu and uranium (U) recovery. It was used in the U.S. on a limited basis for commercial reprocessing. Finally, PUREX is used internationally for commercial and defense reprocessing purposes (PNNL 1998). Conversely, the BPP was an earlier process used only at Hanford in the U.S. government's first production-level campaigns to recover Pu for defense purposes. It processed less than 8% of the SF reprocessed at Hanford.

2.0 BISMUTH PHOSPHATE PROCESS

As illustrated in Figure 3, the BPP[4] was carried out in 221-T plant from 1944 to 1956 and in 221-B plant from 1945 to 1952. As the first reprocessing process ever used at production levels to separate Pu from SF, it was conceived with an emphasis on time and purpose rather than efficiency. The BPP was a batch process. It deployed a complex chemistry that selectively dissolved and precipitated targeted chemical compounds such that simple liquid/solids separations equipment (centrifuges) could isolate Pu from the other materials in the spent fuel as well as materials introduced in the BPP. To place the process in perspective, the government's objective was to separate the one part Pu produced in the fission process from the roughly 10,000 parts of U and fission products that it was dispersed amongst in the SF.

The BPP was quite different from successor reprocessing processes. For example, its sole purpose was to recover Pu. Uranium was discharged as a waste. Conversely, REDOX and PUREX recovered Pu and U, each as a separate product. Also, REDOX and PUREX were continuous solvent extraction processes which used a small fraction of the chemical additives that the BPP required for separations. As a result, the BPP created over 200 times more waste than PUREX per ton of U fuel processed. The BP U Separations process created approximately ~3800 gallons of high-level waste per ton of U (GE 1951) while PUREX created ~40 gallons per ton (ARHCO 1968). This resulted in Hanford's PUREX wastes having substantially higher fission product concentrations than BP wastes. For example, wastes discharged from the BP U Separations process, the BP waste stream with the highest fission product concentrations,

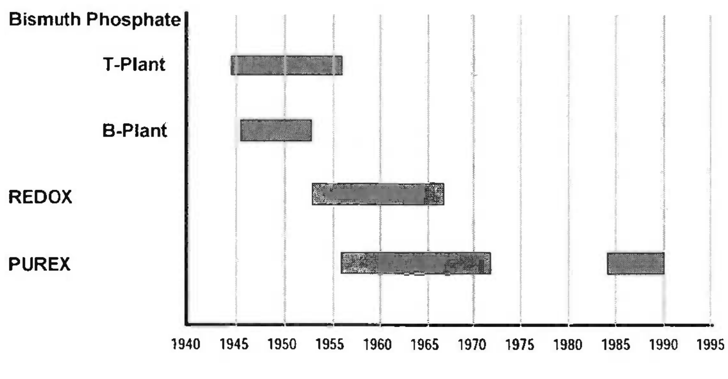


Figure 3. Operating Time Frames for Spent Nuclear Fuel Reprocessing Processes at Hanford

[4] The BPP flowsheets are provided in Attachment A and comparisons between the BPP and the PUREX process wastes are provided in Attachment B.

Figure 4. Generalized Bismuth Phosphate Process Flow Diagram
Source: Johnson 2003.

were reported to have Cs-137 concentrations of approximately 60 Ci/m^3 (GE 1955), < 0.5% of the 13,000 Ci/m^3 Cs-137 concentrations in PUREX 1st cycle raffinate wastes after neutralization (ARHCO 1968).

Figure 4 depicts the major BPP steps. The discussion that follows traces the SF, the Pu product, and the process wastes through the BPP [Note that the numbering of the subsections that follow correspond to the numbers within each outlined block in Figure 4]. The following discussions include general information regarding the chemical processes used. More detail regarding the BPP chemistry and mass flow information can be found in Attachment A.

2.1 Coating Dissolution (Decladding – Figure 4, Block 2.1)

Prior to the actual reprocessing of SF, the aluminum cladding (or coating) had to be removed to expose the U to the acids that would be used to dissolve it. A boiling sodium nitrate/sodium hydroxide solution was used to dissolve cladding. While virtually all of the radioactive fission products remained within the intact spent fuel matrix, small amounts of radioactive materials at the surface of the fuel slugs entered decladding solutions. Decladding operations are considered a "head end" process and not part of spent fuel reprocessing since the spent fuel remained intact throughout the decladding process. The decladding wastes were subsequently combined with 1st cycle Pu decontamination waste (discussed in Section 2.3) to use the excess sodium hydroxide in the decladding wastes to neutralize acids in the 1st cycle decontamination wastes.

2.2 Uranium Dissolution and Uranium Separation (Figure 4, Block 2.2)

Following decladding, the U fuel slugs were dissolved in nitric acid. Once dissolved, water and sulfuric acid were added to convert the uranyl nitrate to uranyl sulfate. Next, bismuth nitrate and phosphoric acid were then added and a bismuth phosphate carrier was formed that extracted Pu from solution as a precipitate. The uranyl sulfate remained in solution along with nearly all of the cesium and approximately 90% of the strontium (CH2MHill 2002). The bismuth phosphate carrier and Pu were then precipitated as a filter cake via centrifuging, the filter cake was rinsed with water and re-centrifuged three times to remove any waste liquids and soluble fission products that may have been initially entrained in the filter cake, and then the Pu cake was transferred to the first Pu decontamination cycle (GE 1951).

Approximately 10% of the fission products that were dissolved with the U stayed with the Pu cake when it moved from U separations to the first Pu decontamination cycle. In addition to strontium, substantial quantities of short-lived[5] fission products, such as zirconium-95 (Zr-95) and niobium-95 (Nb-95), were co-precipitated.

2.3 Plutonium Decontamination (Figure 4, Block 2.3, 1st and 2nd Decon Cycles)

In the first Pu decontamination cycle, the Pu was oxidized to the +6 valence state via the addition of sodium bismuthate and sodium dichromate. Sodium bismuthate, phosphoric acid, zirconium nitrate, and cerium nitrate were added to precipitate bismuth phosphate and fission products (primarily strontium, cerium, and zirconium). The bismuth phosphate and fission product precipitate were centrifuged to separate them from the Pu which remained in the liquid phase. Following separation, the Pu in the liquid phase was reacted with bismuth subnitrate and phosphoric acid to produce a bismuth phosphate carrier and co-precipitate plutonium phosphate. The bismuth phosphate carrier and plutonium phosphate solids were separated from the liquids by centrifugation. The plutonium phosphate solids were water washed and centrifuged three times. The bismuth phosphate and plutonium phosphate solids were then dissolved in nitric acid, forming plutonium nitrate and bismuth nitrate in solution. This solution was then transferred to the second decontamination cycle where the first decontamination process steps (except for zirconium nitrate and cerium nitrate addition) were repeated to further purify the Pu product.

2.4 Plutonium Concentration Building (224-B/T) Wastes (Figure 4, Block 2.4)

The Pu from 221-B/T plants was transferred to the 224-B/T Plutonium Concentration Building to remove the bismuth phosphate and residual fission products which were essentially all short half-life contaminants. The Pu solution was received at 224-B/T in a +4 valence state. It was first oxidized with sodium bismuthate to a +6 valence state. Phosphoric acid was added to precipitate bismuth phosphate along with residual Zr-95 and Nb-95 fission products, which were then removed by centrifugation leaving the Pu in solution. Hydrogen fluoride and lanthanum fluoride were added to precipitate remaining fission products leaving the Pu in solution. Hydrogen fluoride and lanthanum salts were then added to create lanthanum fluoride and plutonium fluoride solids which were separated by centrifugation. The lanthanum fluoride and plutonium fluoride solids were reacted with potassium hydroxide to produce lanthanum hydroxide and plutonium hydroxide. The lanthanum hydroxide and plutonium hydroxide solids were reacted with nitric acid to produce the high purity Pu nitrate/lanthanum nitrate product.

---

[5] Zr-95 has a 64-day half-life and Nb-95 a 35-day half-life. In addition to the Zr-95, other phosphate insoluble short-lived fission products such as Ce-144 (~284 days) were removed to achieve the desired plutonium purity and handling characteristics. The fission products of concern relative to long-term waste management and disposal are Cs-137 (~30 years) and Sr-90 (~29 years) which together with their daughters, Ba-137m and Y-90, account for ~99% of the curies in the Hanford tanks at the present time.

Targeted radionuclides for removal were primarily short-lived fission product and daughter isotopes of zirconium, cerium, lanthanum, ruthenium, praseodymium, and yttrium (DuPont 1945), many of which were difficult to physically separate from the Pu via precipitation processes. Thus, multiple precipitation steps were used in the first and second Pu decontamination cycles and the Pu Concentration Building to separate these short-lived fission products from the Pu product.

3.0 CLASSIFICATION OF TANK WASTES FROM THE BISMUTH PHOSPHATE PROCESS

Although the BPP is referred to using the generic term 'reprocessing', the BPP actually consisted of batch chemical process operations. Unlike the later solvent extraction processes (REDOX, PUREX) which were continuous flow and continuously connected, each operation within the BPP took place on a batch basis. Figure 5 illustrates a typical BPP process step. Feed material enters a process tank. The feed could consist of a re-dissolved solids (such as SF or a Pu cake) from a centrifuge or it could be the liquid phase from a centrifuge as illustrated in Figure 5. In either case, chemical additives (such as those listed in Section 2) are used to selectively keep certain chemical species in solution and to precipitate other species. The mixture is then transferred to a centrifuge where the solids are separated from the liquids by centrifugal force. The liquids are discharged from the centrifuge as it spins and the solids are retained. The tank where the feed and additives were mixed is then rinsed with water to ensure all precipitates are removed. Clean rinse water is sprayed onto the solids in the centrifuge (~3 parts water to 1 part solids) while it operates to replace any process liquids that may have been entrained in the solid cake. The centrifuge is operated two cycles to de-water the cake. Water is again sprayed onto the solids in the centrifuge in a second cake rinse (~3 parts water to 1 part solids) while it operates to wash trace quantities of dilute process liquids from the solid cake. The centrifuge is operated two cycles to de-water the cake. All liquids including rinses pass on to the next process step or are discharged as a waste based on the specific process operation. The solids are dissolved and then transferred to the next BPP process or discharged as a waste, again based on the specific BPP process operation.

In the manner discussed above, each BPP batch process achieved a highly effective liquid/solids separation without cross contamination between batch operations.

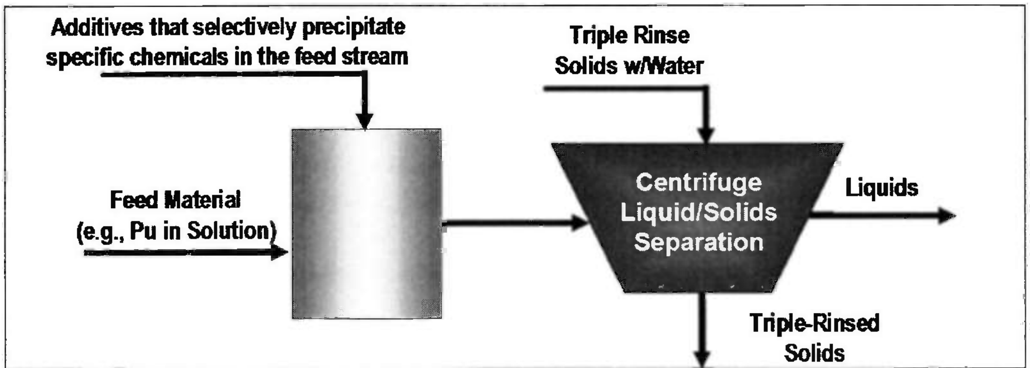


Figure 5 – Typical Bismuth Phosphate Process Operation

The clean separation liquid/solid separations and distinct break between BPP operations provides an ability to clearly demark where reprocessing of SF did and did not occur, where "liquid waste produced directly in reprocessing" was present and where it was not, and consequently, which BPP process operations created HLW and which did not. The process logic is described below.

3.1 Where Did Spent Nuclear Fuel Reprocessing Occur?

SF reprocessing could only occur during BPP process steps where the SF constituent elements existed in solution. That is because the Nuclear Waste Policy Act of 1982 (NWPA) clearly defines spent nuclear fuel as "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing."

Based on that definition, the reprocessing of SF in the BPP occurs during the U dissolution and U separation processes[6] as illustrated in Figure 6. The U dissolution and U separation processes are the only points along the BPP flowsheet where all of the constituent elements of the SF existed in one place. The U dissolution process places the SF constituent elements (U, Pu, fission products) into solution. All of the constituent elements of SF exist at that point. The U separations process then selectively precipitates the Pu. All of the SF constituent elements are present in the mixing tank and in the centrifuge.

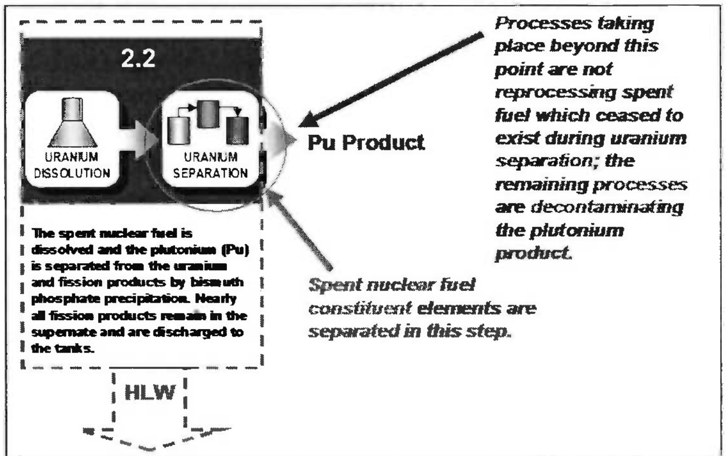


Figure 6. Bismuth Phosphate Reprocessing Processes

Once liquid/solids separations occur in the U separations centrifuge, the SF constituent elements are separated into waste and Pu product cake. At the completion of the Pu product cake water rinses in the centrifuge, the constituent elements of the SF have been fully separated and reprocessing is complete. The resultant waste and product streams are as follows:

- Uranium Separations Liquid Waste Stream – This waste stream includes ~99.5% (by mass) of all materials present in the SF prior to dissolution including ~99.5% of the U, ~90% of all fission products including ~99% of the Cs-137 and ~90% of the Sr-90, a small fraction of the Pu, and chemicals/acids used to keep those materials in the liquid phase (CH2M HILL 2002, Johnson 2003), and
- Plutonium Product Cake – The Pu product cake includes the precipitated Pu, ~0.5% of the U, and ~10% of the fission products, at least half of which are short-lived fission products and daughters (Johnson 2003).

[6] Before uranium dissolution, reprocessing cannot occur since the SF constituent elements could not be separated by reprocessing while still in solid form.

3.2 Which Liquid Wastes Were Produced Directly In Reprocessing?

'[L]iquid waste produced directly in reprocessing' could only have been created during U dissolution and U separations as those two BPP process steps were the only steps where reprocessing took place as described above. The liquid wastes produced directly in reprocessing were separated from the Pu product by centrifugal action.

The Pu product stream was thoroughly rinsed and centrifuged multiple times to remove all traces of the liquids produced directly in reprocessing (and the undesirable contaminants contained in such liquids) from the Pu cake. By the time the cake was transferred to the first Pu decontamination cycle, any residual liquids produced directly in reprocessing that remained in the cake would have been diluted by ~1000:1 and would have represented <0.1% of the volume of liquid created during U dissolution and U separations[7], a negligible volume and concentration. It is therefore DOE's position that the only 'liquid waste produced directly in reprocessing' from the BPP is the liquid waste stream discharged from the U separations process to the SSTs.

3.3 Which BPP Wastes Are HLW?

For the BPP it is evident from then preceding discussions that the liquid waste stream discharged from the U separations process contained "highly radioactive material resulting from the reprocessing of spent nuclear fuel". Those wastes therefore meet the definition of HLW set forth in the NWPA[8]:

> "High-level radioactive waste means:
>
> (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and
>
> (B) other highly radioactive material that the NRC, consistent with existing laws, determines by rule requires permanent isolation."

The U separations liquid waste stream is therefore identified in Figure 6 as HLW. That waste stream contained approximately 95% of the fission products important to DOE in determining the waste disposal pathway, i.e., ~99% of the Cs-137 and ~90% of the Sr-90, the two fission products that, with their secular equilibrium daughters, account for 99% of the radioactivity in the Hanford tanks[9].

---

[7] Cake volume approximately 10 gallons, moisture content ~30%. Waste from U separations approximately 2400 gallons (GE 1951). On that basis, (10)(0.3)/2400 = 0.1% of liquids produced directly in reprocessing should remain in the cake after first liquid/solid separation. Each rinse used 30 gallons of water (GE 1951). Assuming 3 gallons of liquid in the cake (30%) and three separate 30 gallon rinses (including tank rinse), each rinse should reduce the concentration by a factor of 10. Moreover, any such liquid would be highly diluted (by a factor of 1000 due to the three rinses) before the cake was dissolved and transferred.

[8] This same definition is incorporated by reference into the Atomic Energy Act of 1954 (AEA), as amended, and the Waste Isolation Pilot Plant Land Withdrawal Act.

[9] Ba-137m and Y-90 are daughters of Cs-137 and Sr-90, respectively, that are in secular equilibrium, i.e., the half-life of the parent radioisotopes (Cs-137 and Sr-90) is so much longer than that of the daughters that the radioactivity of the daughters is essentially equal to that of the parent.

The liquid wastes produced directly in reprocessing are part of that waste stream and were not present in the BPP Pu-related processes that followed U separations.

Accordingly, wastes from the BPP 1st and 2nd decontamination cycles are not HLW. Similarly, wastes from Pu concentration activities that further processed the product stream from the BPP in 224-B/T buildings were also not HLW.

4.0 TRU DETERMINATION – Candidate Wastes for Classification as Contact-Handled TRU

The Waste Isolation Pilot Plant Land Withdrawal Act defines transuranic waste (TRU) as:

> "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for (A) high-level radioactive waste; (B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with Part 61 of title 10, Code of Federal Regulations".

The waste streams from the BPP first and second decontamination cycles and the Plutonium Concentration Cycle that were carried out in the 224-B/T buildings are currently contained in 11 SSTs along with the decladding waste. Based upon the discussions in Section 3, none of those tanks contain HLW as defined in the NWPA.

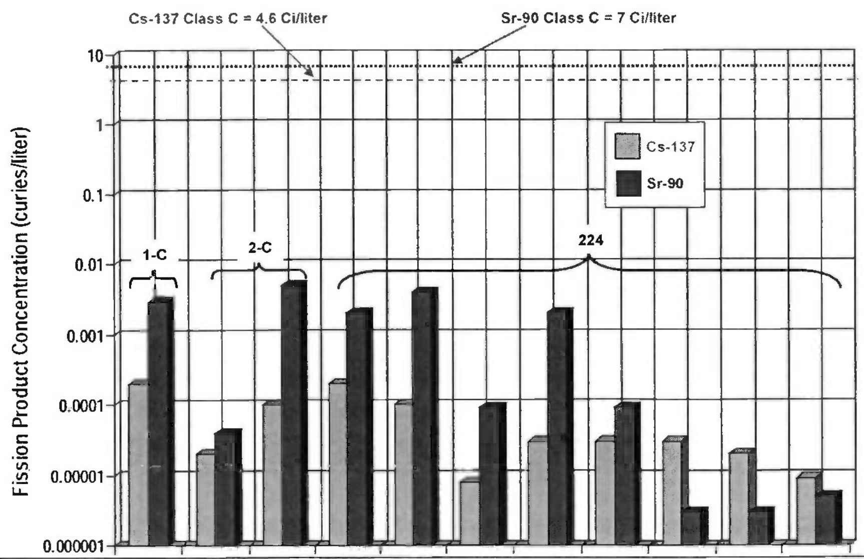


Figure 7. Cs-137 and Sr-90 Concentrations in Candidate TRU Tanks

Fission product concentrations[10] for the wastes in the 11 SSTs are illustrated in Figure 7. The two dotted/dashed lines near the top of Figure 7 indicate the Class C concentration limits for Cs-137 (4.4 curies per liter) and Sr-90 (7 curies per liter)[11].

All 11 SSTs would be Class A or Class B solely on the basis of the §61.55 concentrations related to fission products[12]. Based on the fission product content, DOE estimates that all 11 tanks will result in contact-handled[13] TRU once dewatered and packaged. The transuranic material content for each SST is indicated in Figure 8,

The tanks are grouped in Figure 8 according to the primary origin of their contained wastes from within or resulting from the BPP. The first eight tanks are all 200-series, 55,000 gallon, SSTs that contain 224-B/T Plutonium Concentration Building wastes.

Figure 8. Candidate Contact-Handled Single-Shell Tanks TRU Waste Designation

Tank	Waste Volume (kgal)	Waste Types (See Key Below)	TRU (nanocuries/gm)	Cs-137 (curies/liter)	Sr-90 (curies/liter)
Group I – Single-Shell Tanks Containing 224 Building Waste					
B-201	30	224	824	0.0002	0.002
B-202	29	224	214	0.0001	0.004
B-203	51	224	297	0.000008	0.00009
B-204	50	224	263	0.00003	0.0017
T-201	29	224	754	0.00004	0.0001
T-202	21	224	221	0.00003	0.000003
T-203	37	224	295	0.00002	0.000003
T-204	37	224	243	0.000009	0.000005
Group II – Single-Shell Tanks Containing 224 Building Waste and 2nd Decontamination Cycle Waste					
T-110	370	224/2C	67 (170 after drying)	0.00002	0.00004
T-111	447	224/2C/DW	182	0.0001	0.005
Group III – Single-Shell Tanks Containing 1st Decontamination Cycle Waste					
T-104	317	1C/CW	158	0.0002	0.003

KEY TO WASTE TYPE DESIGNATION

Waste Type	Description
1C	First Pu Decontamination Cycle Waste from Bismuth Phosphate Plant
2C	Second Pu Decontamination Cycle Waste from Bismuth Phosphate Plant
224	224-B/T Plutonium Concentration Building Waste
CW	Coating Removal Waste from Dissolution of the Coating on Spent Nuclear Fuel
DW	Equipment decontamination waste from 221-T Plant

[10] At the present time, Cs-137 and Sr-90 together with their daughters in secular equilibrium (Ba-137m and Y-90) represent ~99% of the fission product activity in the Hanford tanks (Best Basis Inventory in the Hanford TWINS database).

[11] 10 CFR 61.55, Table 2. That regulation indicates the concentrations in curies per cubic meter. The Class C concentrations for Cs-137 and Sr-90 are 4400 curies per cubic meter and 7000 curies per cubic meter, respectively.

[12] The wastes exceed the Table 1 limits in §61.55 for alpha-emitting radionuclides, however, for defense wastes containing alpha-emitting radionuclides, the TRU definition in the WIPP Land Withdrawal Act are governing.

[13] Contact dose at the package surface will be less than 200 mR/hour.

The second group of tanks contain Plutonium Concentration Building wastes along with wastes from the BPP second decontamination cycle. T-111 also contains decontamination wastes.

The last group has one tank, T-104. It received BPP wastes from coating dissolution and the first decontamination cycle.

DOE has used historical information, sampling, and analysis to determine that the 11 SSTs identified in Figures 7 and 8 are valid candidates to receive a contact-handled TRU designation. That designation will be achieved through a ROD pursuant to the National Environmental Policy Act of 1969.

5.0 REFERENCES

Anderson 1990. "A History of the 200 Area Tank Farms", WHC-MR-0132, J.D. Anderson, Westinghouse Hanford Company, Richland, WA, 1990

ARHCO 1968. "PUREX Chemical Flowsheet Processing Aluminum Clad Uranium Fuels", ARH-214, Atlantic Richfield Hanford Company, Richland, WA, 1968

CH2M HILL 2002. Interoffice Memo from B. Higley, Inventory and Flowsheet Engineering, to J.G. Field, R2-12, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model", 7G300-02-NWK-024, CH2M Hill Hanford Group, Inc., Richland, WA, July 24, 2002.

DuPont 1944. "Hanford Technical Manual", HW-10475-C, Section C, DuPont Company, Richland, WA, 1944

DuPont 1945. "Decontamination of Fission elements in the Separation Process", HW-3-1493, DuPont Company, Richland, WA, 1945

GE 1951. "Flow Sheets and Flow Diagrams of Precipitation Separations Process", HW-23043. General Electric Company, Richland, WA, 1951.

GE 1952. "Hanford Works Monthly Report for July 1952", HW-25227-DEL, pgs Ed-1 through Ed-6, General Electric Company, Richland, WA, 1952.

GE 1955. "Decontamination of Uranium Recovery Process Stored Wastes", Interim Report, HW-36717, General Electric Company, Richland, WA, 1955

GE 1957. "Ultimate Disposal of PUREX Wastes", HW-52824, General Electric Company, Richland, WA, 1957.

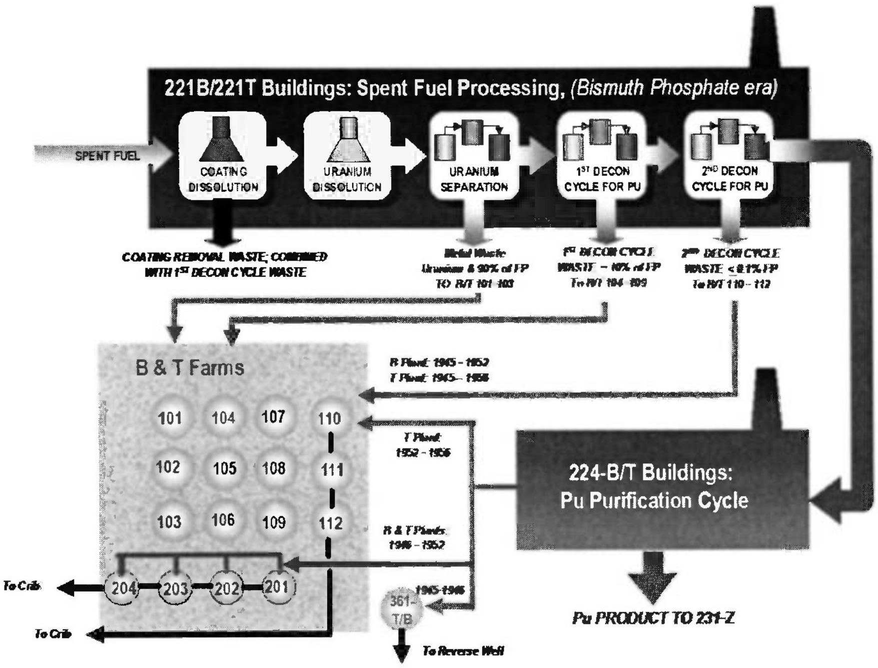
Johnson 2003. "Origin of Wastes in the B-200 and T-200 Series Single-Shell Tanks", M. E. Johnson, RPP-13300, Rev. 0, CH2M HILL Hanford Group, Inc., April 2003.

10 CFR Part 61, Licensing Requirements For Land Disposal Of Radioactive Waste, §61.55, Waste Classification.

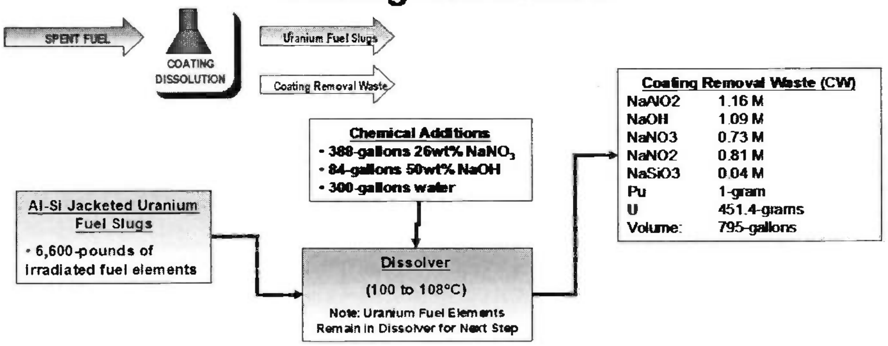
PNNL 1998. "International Waste Management Fact Book", PNNL-11677, Pacific Northwest National Laboratory, Richland, WA, 1998.

Best Basis Inventory (BBI), Tank Waste Information Network System (TWINS), http://twins.pnl.gov/twins.htm

APPENDIX A – Chemical Reactions for the Bismuth Phosphate Flow Sheet



Coating Dissolution

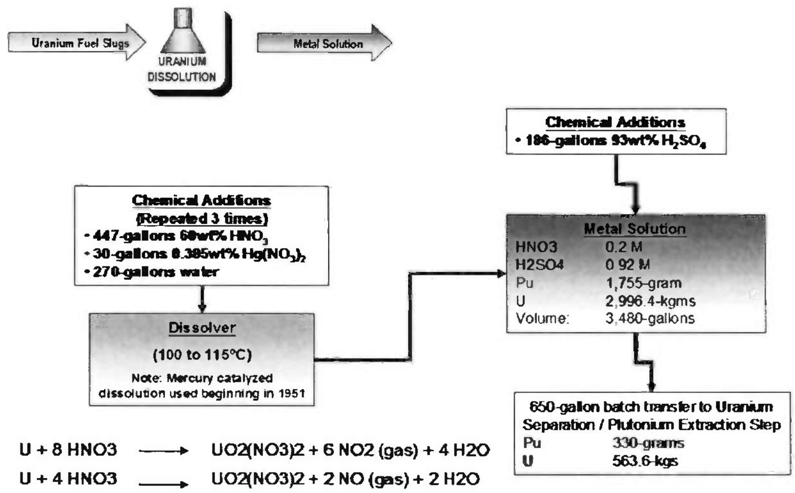


$$2\,Al + 2\,NaOH + 3\,NaNO_3 \longrightarrow 2\,NaAlO_2 + 3\,NaNO_2 + H_2O$$

$$8\,Al + 5\,NaOH + 3\,NaNO_3 + 2\,H_2O \longrightarrow 8\,NaAlO_2 + 3\,NH_3$$

NOTE: The BPP flowsheets in Appendix A were developed by Michael Johnson of CH2MHILL Hanford Group, Inc in December 2003 based upon his review of historical Hanford documents and records as identified at the end of this appendix.

Uranium Dissolution



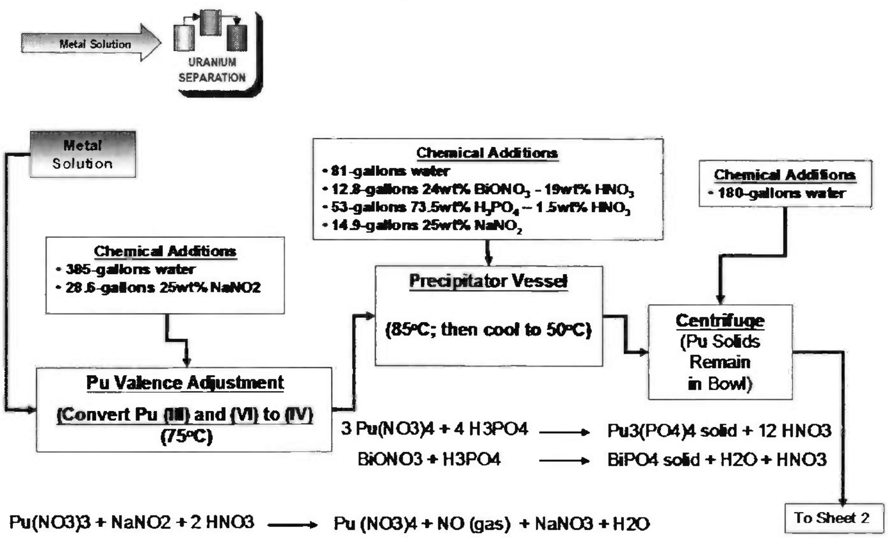
U + 8 HNO3 ⟶ UO2(NO3)2 + 6 NO2 (gas) + 4 H2O

U + 4 HNO3 ⟶ UO2(NO3)2 + 2 NO (gas) + 2 H2O

Pu + 8 HNO3 ⟶ Pu(NO3)4 + 4 NO2 (gas) + 4 H2O

Note: Pu is dissolved and forms Pu nitrate in the +3, +4, and +6 valence state

Uranium Separation / Plutonium Extraction
(Sheet 1)



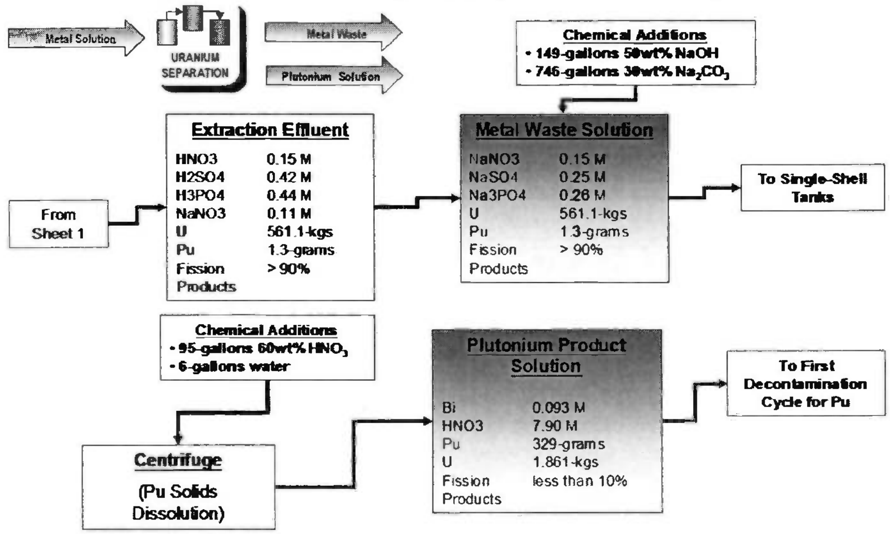
3 Pu(NO3)4 + 4 H3PO4 ⟶ Pu3(PO4)4 solid + 12 HNO3

BiONO3 + H3PO4 ⟶ BiPO4 solid + H2O + HNO3

Pu(NO3)3 + NaNO2 + 2 HNO3 ⟶ Pu (NO3)4 + NO (gas) + NaNO3 + H2O

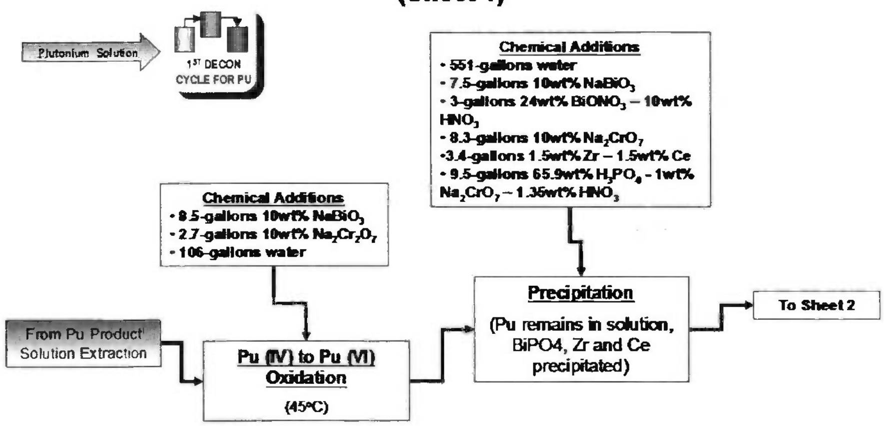
PuO2(NO3)2 + NaNO2 + 2 HNO3 ⟶ Pu(NO3)4 + NaNO3 + H2O

Uranium Separation / Plutonium Extraction
(Sheet 2)



$Pu_3(PO_4)_4 + BiPO_4 + 15\ HNO_3\ (conc.) \longrightarrow 3Pu(NO_3)_4 + Bi(NO_3)_3 + 5\ H_3PO_4$

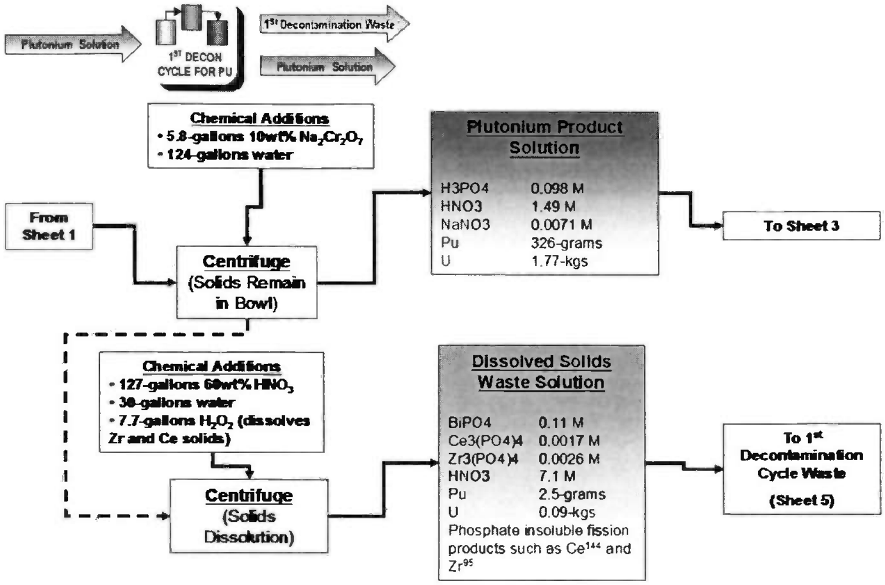
First Decontamination Cycle for Plutonium
(Sheet 1)



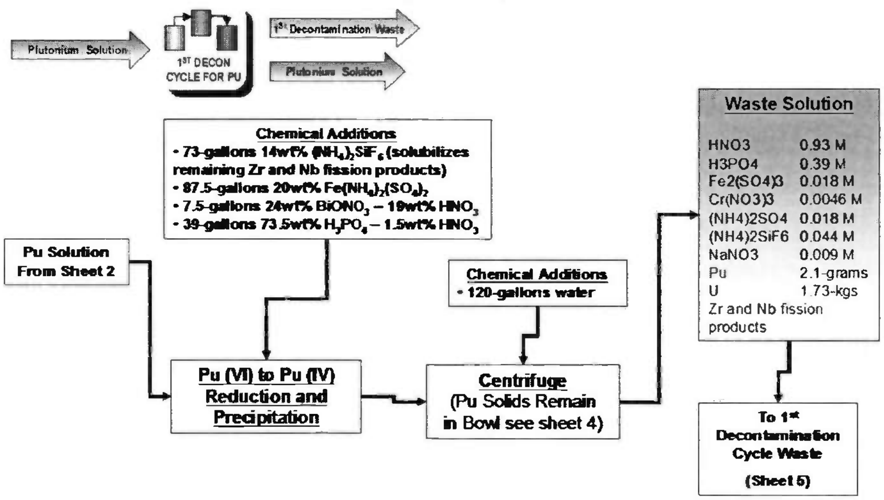
$Pu(NO_3)_4 + NaBiO_3 \longrightarrow PuO_2(NO_3)_2 + BiONO_3 + NaNO_3$

$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4\ (solid) + HNO_3 + H_2O$

First Decontamination Cycle for Plutonium
(Sheet 2)



First Decontamination Cycle for Plutonium
(Sheet 3)



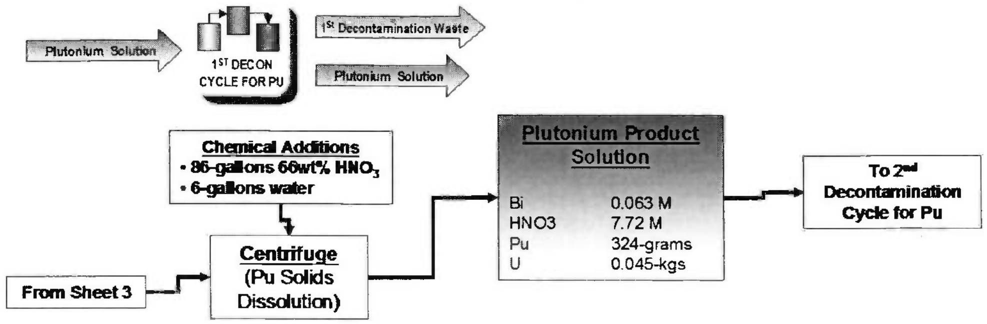
$$PuO_2(NO_3)_2 + 2\,Fe(NH_4)_2(SO_4)_2 + 4\,HNO_3 \longrightarrow Pu(NO_3)_4 + Fe_2(SO_4)_3 + 2\,NH_4NO_3 + (NH_4)_2SO_4$$

$$3\,Pu(NO_3)_4 + 4\,H_3PO_4 \longrightarrow Pu_3(PO_4)_4 \text{ solid} + 12\,HNO_3$$

$$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4 \text{ solid} + H_2O + HNO_3$$

First Decontamination Cycle for Plutonium

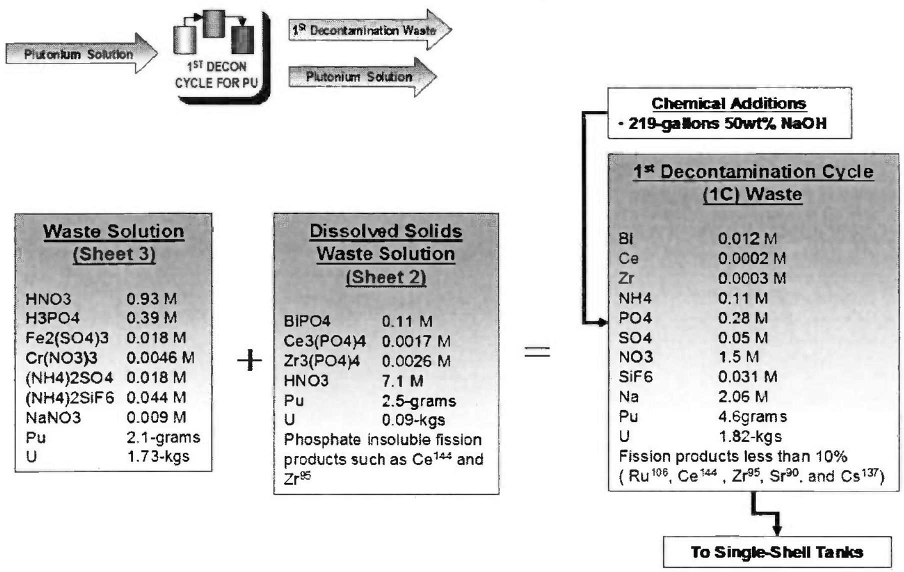
(Sheet 4)



$$Pu_3(PO_4)_4 + BiPO_4 + 15\ HNO_3\ (conc.) \longrightarrow 3Pu(NO_3)_4 + Bi(NO_3)_3 + 5\ H_3PO_4$$

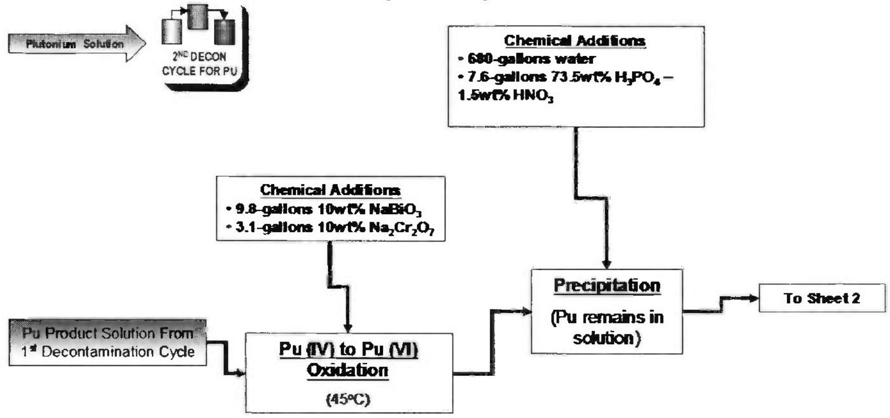
First Decontamination Cycle for Plutonium

(Sheet 5)



Second Decontamination Cycle for Plutonium

(Sheet 1)

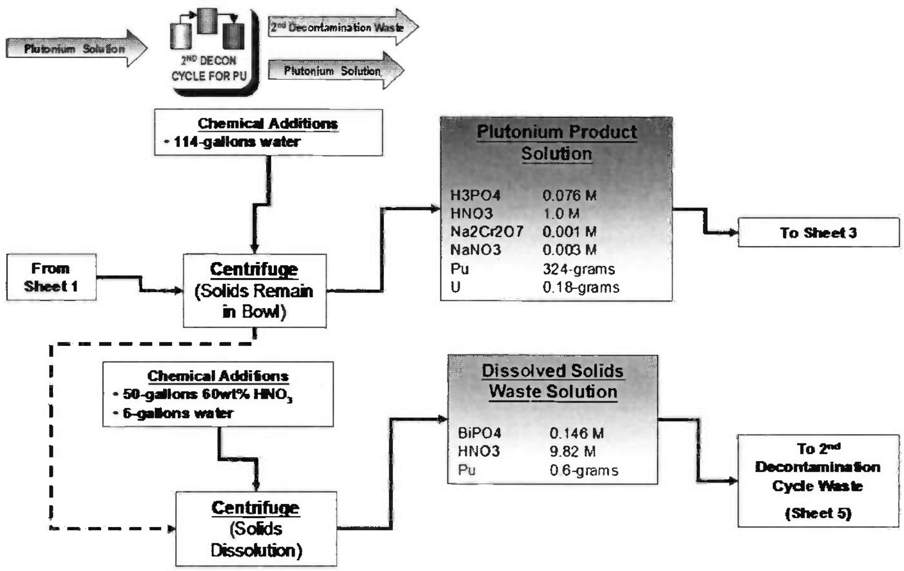


$Pu(NO_3)_4 + NaBiO_3 \longrightarrow PuO_2(NO_3)_2 + BiONO_3 + NaNO_3$

$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4\ (\text{solid}) + HNO_3 + H_2O$

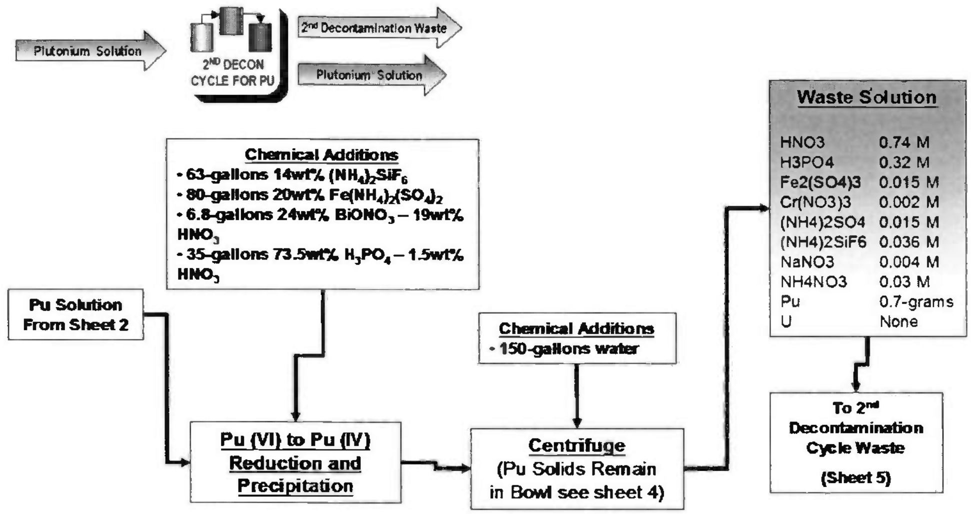
Second Decontamination Cycle for Plutonium

(Sheet 2)



Second Decontamination Cycle for Plutonium

(Sheet 3)



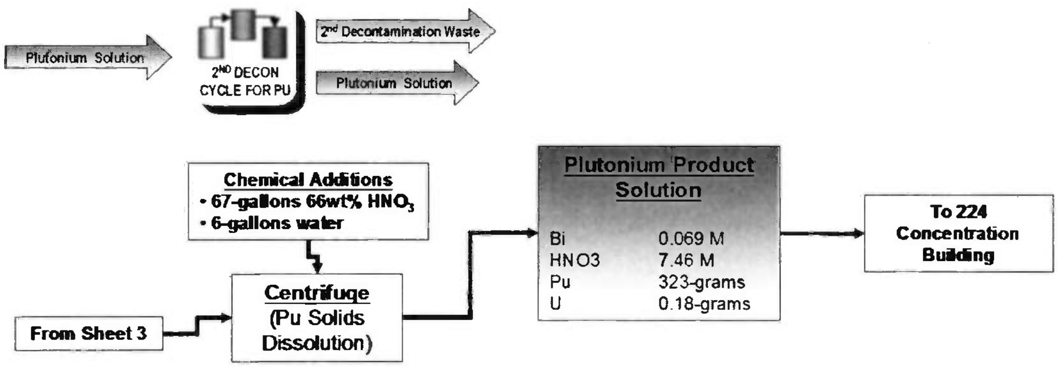
$$PuO_2(NO_3)_2 + 2\ Fe(NH_4)_2(SO_4)_2 + 4\ HNO_3 \longrightarrow Pu(NO_3)_4 + Fe_2(SO_4)_3 + 2\ NH_4NO_3 + (NH_4)_2SO_4$$

$$3\ Pu(NO_3)_4 + 4\ H_3PO_4 \longrightarrow Pu_3(PO_4)_4\ \text{solid} + 12\ HNO_3$$

$$BiONO_3 + H_3PO_4 \longrightarrow BiPO_4\ \text{solid} + H_2O + HNO_3$$

Second Decontamination Cycle for Plutonium

(Sheet 4)



$$Pu_3(PO_4)_4 + BiPO_4 + 15\ HNO_3\ (\text{conc.}) \longrightarrow 3Pu\ (NO_3)_4 + Bi(NO_3)_3 + 5\ H_3PO_4$$

Second Decontamination Cycle for Plutonium

(Sheet 5)

Dissolved Solids Waste Solution (Sheet 2)

BiPO4	0.146 M
HNO3	9.82 M
Pu	0.6-grams

+

Waste Solution (Sheet 3)

HNO3	0.74 M
H3PO4	0.32 M
Fe2(SO4)3	0.015 M
Cr(NO3)3	0.002 M
(NH4)2SO4	0.015 M
(NH4)2SiF6	0.036 M
NaNO3	0.004 M
NH4NO3	0.03 M
Pu	0.7-grams
U	None

=

Chemical Additions
- 174-gallons 50wt% NaOH

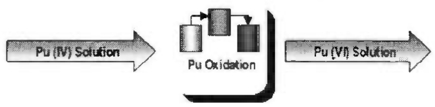
2nd Decontamination Cycle (2C) Waste

Bi	0.006 M
Fe	0.033 M
Cr	0.001 M
NH4	0.095 M
PO4	0.24 M
SO4	0.038 M
SiF6	0.026 M
NO3	0.99 M
Na	1.60 M
Pu	1.3-grams

Fission products less than 0.1% (Ru^{106}, Ce^{144}, Zr^{95}, Sr^{90}, and Cs^{137})

To Single-Shell Tanks

Bismuth Phosphate Cross-Over: Pu (IV) to Pu (VI) Oxidation



From 221 Plant 2nd Decontamination Cycle for Pu

Plutonium Solution

BIPO4	0.069 M
HNO3	7.46 M
Pu	323-grams
U	0.18-grams

Chemical Additions
- 96-gallons water
- 32.8-gallons 3.9wt% $NaBiO_3$ - 1.4wt% $Na_2Cr_2O_7$

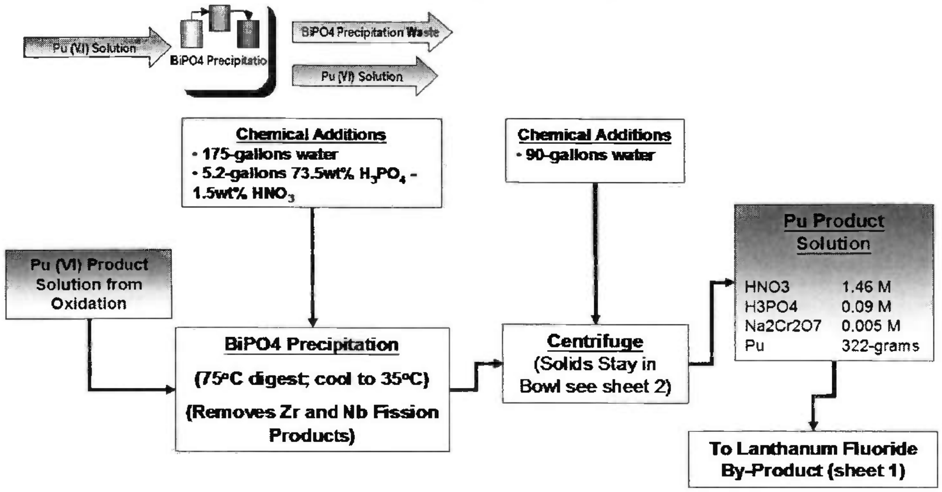
Pu (IV) to Pu (VI) Oxidation

(45°C)

Pu (VI) Product Solution to BiPO4 Precipitation

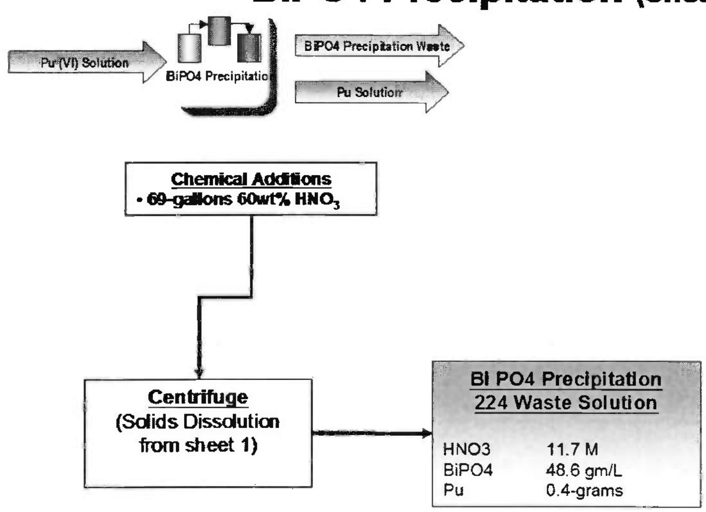
$$Pu(NO_3)_4 + NaBiO_3 \longrightarrow PuO_2(NO_3)_2 + BiONO_3 + NaNO_3$$

Bismuth Phosphate Cross-Over: BiPO4 Precipitation (Sheet 1)

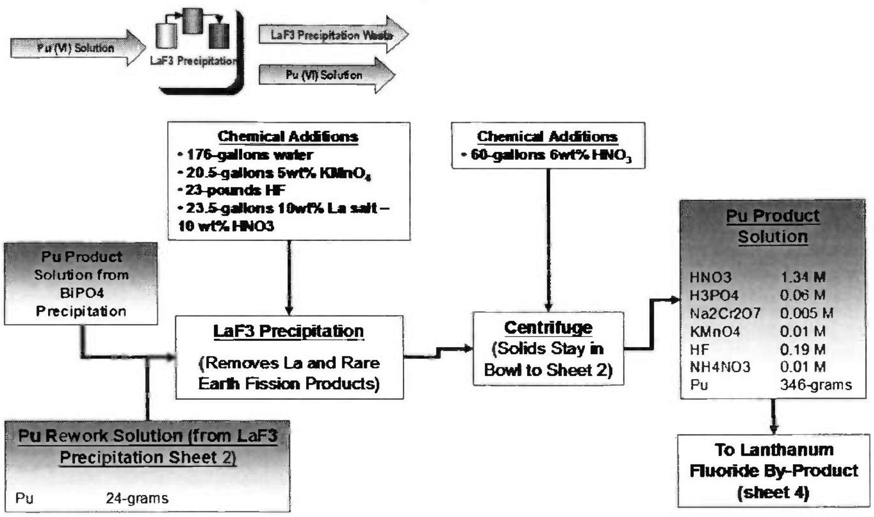


BiONO3 + H3PO4 ⟶ BiPO4 solid + HNO3 + H2O

Bismuth Phosphate Cross-Over: BiPO4 Precipitation (Sheet 2)

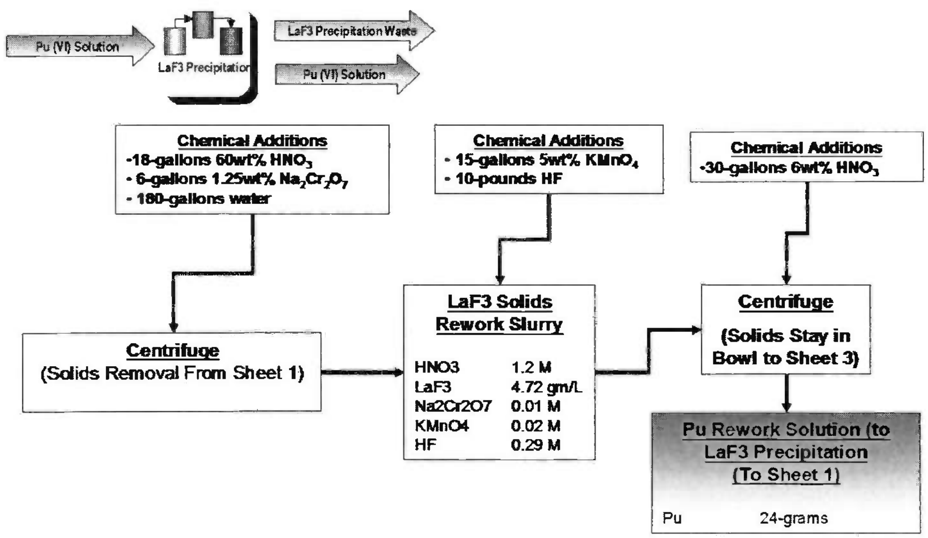


Lanthanum Fluoride By-Product:
LaF3 Precipitation (Sheet 1)

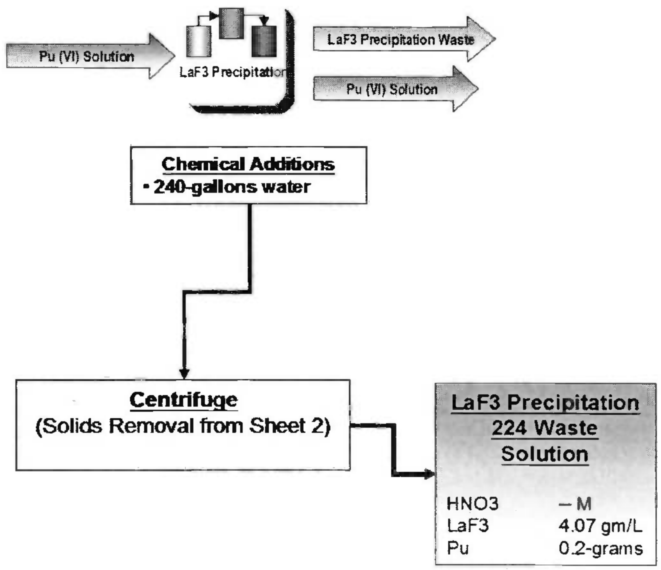


$La(NH_4)_2(NO_3)_5 + 3\ HF \rightarrow LaF_3 + 2NH_4NO_3 + 3\ HNO_3$

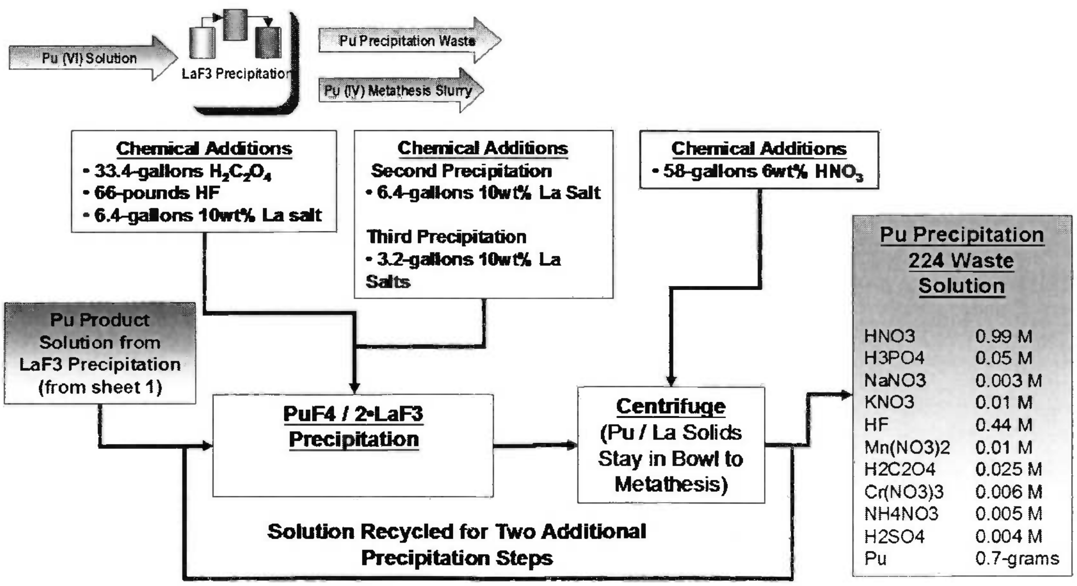
Lanthanum Fluoride By-Product:
LaF3 Precipitation (Sheet 2)



Lanthanum Fluoride By-Product: LaF3 Precipitation (Sheet 3)



Lanthanum Fluoride By-Product: Pu (VI) to Pu (IV) Reduction and Precipitation (sheet 4)

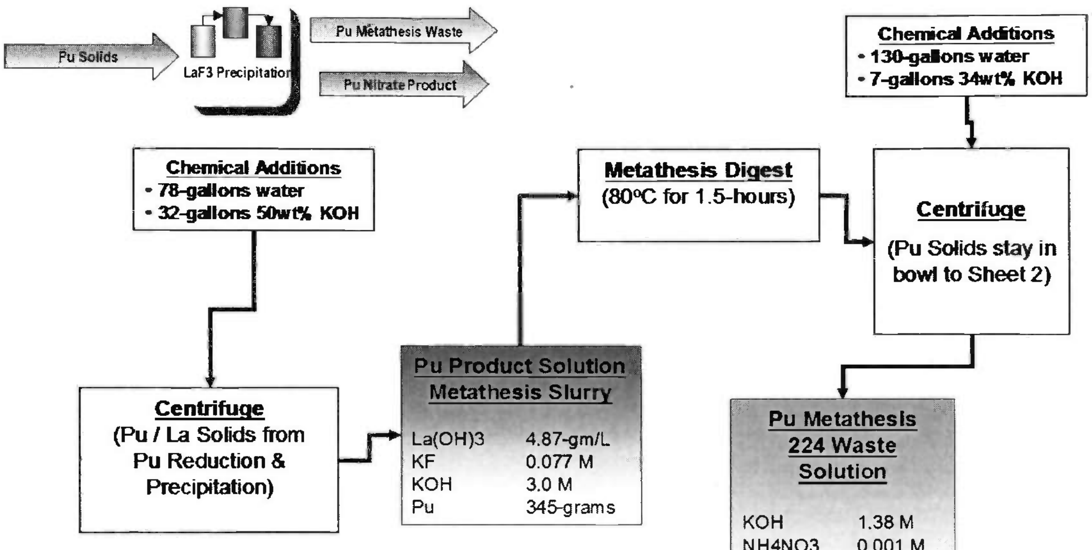


$2\ HNO_3 + H_2C_2O_4 + PuO_2(NO_3)_2 \longrightarrow Pu(NO_3)_4 + CO_2\ (gas) + 2\ H_2O$

$Pu(NO_3)_4 + 4\ HF \longrightarrow PuF_4 + 4\ HNO_3$

$2\ La(NH_4)_2(NO_3)_5 + 6\ HF \longrightarrow 2\ LaF_3 + 6\ HNO_3 + 4\ NH_4NO_3$

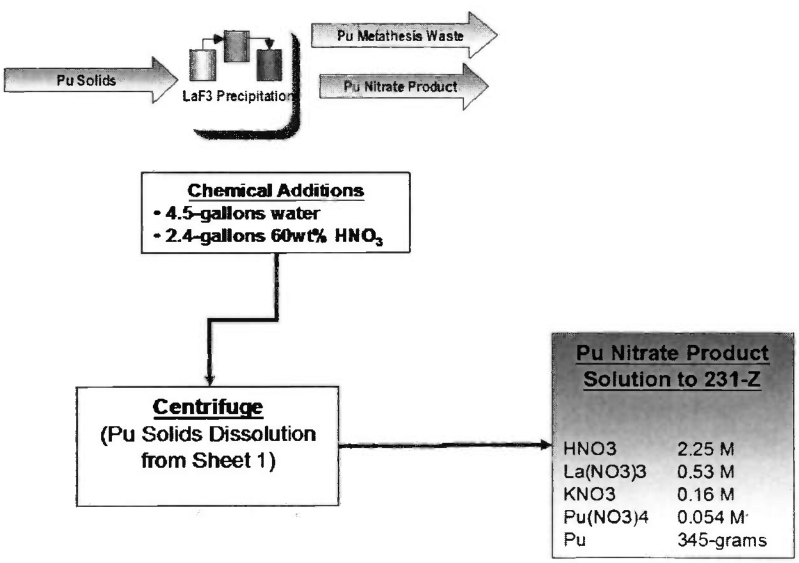
Plutonium Metathesis (Sheet 1)



PuF_4 solid + 4 KOH $\longrightarrow$ $Pu(OH)_4$ solid + 4 KF

2 LaF_3 solid + 6 KOH $\longrightarrow$ 2 $La(OH)_3$ solid + 6 KF

Plutonium Metathesis (Sheet 2)



$Pu(OH)_4$ solid + 4 HNO_3 $\longrightarrow$ $Pu(NO_3)_4$ + 4 H_2O

$La(OH)_3$ solid + 3 HNO_3 $\longrightarrow$ $La(NO_3)_3$ + 3 H_2O

224 Building Waste

Chemical Additions
- 185-gallons 50wt% NaOH

Bi PO4 Precipitation 224 Waste Solution

HNO3	11.7 M
BiPO4	48.6-gm/L
Pu	0.4-grams

+

LaF3 Precipitation 224 Waste Solution

HNO3	– M
LaF3	4.07 gm/L
Pu	0.2-grams

+

Pu Metathesis 224 Waste Solution

KOH	1.38 M
NH4NO3	0.001 M
KNO3	0.004
KF	0.032
Pu	0.1-grams

+

Pu Precipitation 224 Waste Solution

HNO3	0.99 M
H3PO4	0.05 M
NaNO3	0.003 M
KNO3	0.01 M
HF	0.44 M
Mn(NO3)2	0.01 M
H2C2O4	0.025 M
Cr(NO3)3	0.006 M
NH4NO3	0.005 M
H2SO4	0.004 M
Pu	0.7-grams

=

Combined 224 Waste
(gm/L)

Bi	1.18
PO4	3.05
NO3	42.4
La	0.49
F	5.6
Na	36.8
K	8.53
Cr	0.17
Mn	0.33
C2O4	1.29
NH4	0.12
SO4	0.35
Pu	1.4-grams

Less than 0.001% of Fission Products that entered with spent fuel to 221 Plant

To Single-Shell Tanks

References for Appendix A Flowsheets:

HW-10475-C, 1944, *Hanford Technical Manual Section C*, General Electric Hanford Atomic Products Operation, Richland, Washington

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington

HW-26365, 1952, *Brief Summary of Separations Processes*, General Electric Company, Richland, Washington

APPENDIX B – Bismuth Phosphate and PUREX Process Waste Stream Characteristics

Table B-1. Comparison of Bismuth Phosphate and PUREX Process Waste Streams

Waste Stream	Gross Beta Radioactivity µCi/ml	Gross Gamma Radioactivity µCi/ml	Sr-90 µCi/ml	Cs-137 µCi/ml	Waste Batch Volume (gallons)[14]	Waste Batch (gallons / U Ton	Comment
221-T / 221-T Bismuth Phosphate Plant and 224-T / 224-B Pu Concentration Processing Wastes							
Uranium Separations Metal Waste	127	22	Not Reported	Not Reported	2380	3840	Average of three samples taken in 1947. Fission products in Metal waste had decayed for 1 to 2 years; see Table B-2.
Uranium Separations Metal Waste	Not Reported	Not Reported	0.59	57.3	Not Reported		Average Cs and Sr concentrations in Metal waste after U removal in the TBP Plant; see Table B-3
First Pu Product Decontamination Cycle (1C) Waste mixed with Coating Removal Waste (CW)	0.39	0.22	0.0058	0.15	2822	4551	Average fission products concentrations in 1C/CW waste; see Table B-3.
Second Pu Product Decontamination Cycle (2C) Waste	0.0018	0.003	Not Reported	Not Reported	2090	3370	Average fission products concentrations in 2C waste; see Table B-2
224 Pu Product Concentration Building Waste	0.14	0.03	Not Reported	Not Reported	2200	3550	See HW-10728, page 9, 1948, *Process Waste Data – 200 Areas*, Letter from R. S. Bell to file dated August 12, 1948, General Electric Company, Richland Washington
PUREX First Cycle Raffinate							
Waste Stream	**Gross Beta Radioactivity µCi/ml**	**Gross Gamma Radioactivity µCi/ml**	**Sr-90 µCi/ml**	**Cs-137 µCi/ml**	**Waste Batch Volume (gallons)**	**Waste Batch (gallons / U Ton**	**Comment**
PUREX 1WW (concentrated aqueous waste from 1st cycle solvent extraction *before concentration and neutralization; after 1-year decay*)	Not Reported	Not Reported	5,300	5,100	100	100	HW-52824, page 7, 1957, *Ultimate Disposal of PUREX Wastes*, General Electric Company, Richland Washington. (1957 PUREX Flowsheet for processing 600 MWD / ton natural U fuel)
PUREX 1WW (concentrated aqueous waste from 1st cycle solvent extraction *after sugar denitration, concentration and neutralization*)	Not Reported	Not Reported	~ 218,800 (includes Sr^{89} and Sr^{90})	~12,700	657.4 (assuming 16-tons Uranium processed per batch)	41.1	ARH-214, 1968, PUREX Chemical Flowsheet Processing Aluminum Clad Uranium Fuels, Atlantic Richfield Hanford Company, Richland Washington. (1968 PUREX Flowsheet for processing 600 MWD/ton natural U fuel; includes internal recycle of wastes and sugar denitration of 1WW)

[14] Bismuth Phosphate Process waste volumes are from HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington

Table B-2. Analyses of Bismuth Phosphate Process Supernatant

Waste Type[1,2]	Tank	Date Filled	pH	Pu µGm/liter	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101		10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	08/1945	10	35	110	25	7-01-1947
Metal Waste	T-102	11/1945	9.9	60	120	20	7-01-1947
Metal Waste	T-103	02/1946	9.8	60	150	20	7-01-1947
	Average for three samples taken in 1947			51.7	126.7	21.7	
1C/CW	B-109	04/1946	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	04/1947	9.9	12	12	4.4	3-18-1947
2C[4]	B-111	04/1946	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	08/1946	6.8	4.32E??[3]	1.5E-03	3.0E-03	7-1-1947

Notes:

(1) See HW-10728, 1948, *Process Waste Data – 200 Areas*, Letter from R. S. Bell to file dated August 12, 1948, General Electric Company, Richland Washington and HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland Washington.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 2C waste was neutralized to a pH of approximately 10. The waste collected in tanks 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Reduction in the gross gamma and beta analyses for the metal waste in tank T-101 from sampling in 12-12-1946 to 07-01-1947 is due to decay of short-lived fission products.

Table B-3. Radionuclide Analyses of Metal Waste and First Decontamination Cycle Waste

Tank	Date Filled	Pu µgm/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y – Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle Waste Mixed with Coating Removal Waste Supernatant [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.012	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.012		0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037		0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.006	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.0058**	**0.15**						

Notes:
[1] HW-36717, Decontamination of Uranium Recovery Process Stored Wastes Interim Report, May 16, 1955, W. W. Schulz, General Electric Company, Richland Washington.
[2] HW-20195, Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants, February 5, 1951, General Electric Company, Richland Washington.
[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

INTEROFFICE MEMORANDUM

washington river protection solutions

WRPS-1105653

Date: November 21, 2011

To: A.R. Tedeschi, E6-30

From: B.R. Thompson, B1-55 BRT 11/21/11

Subject: SELECT TANK ANALYTE CONCENTRATIONS IN SUPPORT OF CH-TRU PERMIT MODIFICATION

Reference:

1. Tank Waste Information Network System (TWINS), Queried 11/03/11 http://twins.pnl.gov/twins.htm

Enclosed is a table comparing adjusted analyte concentrations in sludge waste for tanks AZ-101, B-101, B-103, T-101, T-102, and T-103 with the average adjusted analyte concentrations in sludge waste for tanks containing potential TRU waste (B200 series, T200 series, T-104, T-110, T-111).

Calculations to determine adjusted analyte concentration per total sludge mass in each tank are documented in the attached informal calculation. All inputs used in the calculations were obtained from the Best-Basis Inventory from the Tank Waste Information Network System (TWINS) database [1].

Let me know if you have questions.

BRT

Enclosures: Adjusted Analyte Concentrations.pdf
Summary Table of Adjusted Analyte Concentrations.docx

APPROVAL:

J.G. Reynolds 11/21/2011
Manager, Tank Waste Inventory & Characterization Date

cc: J.G. Reynolds, B1-55

Table 1 – Summary of adjusted analyte concentration in sludge waste

	Sludge Waste[1] [μCi/g]	HLW Sludge [μCi/g]					
Analyte	**B200/T200 Series[2], T-104, T-110, T-111**	**AZ-101**	**B-101**	**B-103**	**T-101**	**T-102**	**T-103**
^{129}I	3E-08 (*0E+00 to 3E-07*)	1E-03	5E-07	5E-07	3E-07	1E-04	8E-05
^{137}Cs	5E-02 (*6E-03 to 1E-01*)	7E+02	1E+00	2E+00	6E-01	1E+01	1E+00
^{137m}Ba	4E-02 (*6E-03 to 1E-01*)	7E+02	1E+00	2E+00	5E-01	1E+01	1E+00
^{14}C	4E-06 (*1E-07 to 4E-05*)	1E-03	1E-04	8E-05	10E-04	3E-02	6E-04
^{151}Sm	1E-02 (*4E-03 to 6E-02*)	4E+02	2E+02	8E-02	2E-02	2E-02	2E-02
^{90}Sr	9E-01 (*2E-03 to 4E+00*)	2E+04	1E+03	4E+01	5E-01	1E+02	4E+00
^{90}Y	9E-01 (*2E-03 to 4E+00*)	2E+04	1E+03	4E+01	5E-01	1E+02	4E+00
^{99}Tc	1E-03 (*1E-08 to 8E-03*)	2E-01	7E-03	1E-03	2E-04	1E-02	8E-04
^{233}U	2E-10 (*2E-15 to 1E-09*)	5E-04	6E-07	7E-08	2E-08	1E-02	7E-03
^{234}U	2E-04 (*2E-09 to 1E-03*)	2E-03	1E-02	9E-02	10E-03	10E-03	5E-03
^{235}U	7E-06 (*9E-11 to 5E-05*)	10E-05	6E-04	4E-03	4E-04	4E-04	2E-04
^{236}U	2E-06 (*2E-11 to 1E-05*)	3E-04	2E-04	7E-04	3E-04	1E-04	8E-05
^{237}Np	3E-06 (*1E-07 to 3E-05*)	4E-02	2E-05	6E-06	1E-06	3E-04	1E-06
^{238}Pu	2E-03 (*4E-04 to 6E-03*)	5E-01	2E-01	2E-06	2E-02	7E-04	6E-04
^{238}U	2E-04 (*2E-09 to 1E-03*)	2E-03	1E-02	9E-02	7E-03	10E-03	5E-03
^{239}Pu	3E-01 (*6E-02 to 8E-01*)	4E+00	2E+00	6E-04	9E-01	3E-02	2E-02
^{240}Pu	2E-02 (*6E-03 to 5E-02*)	1E+00	6E-01	4E-05	2E-01	7E-03	6E-03
^{241}Am	3E-02 (*5E-03 to7E-02*)	8E+01	9E+00	1E-04	9E-02	2E-01	3E-03
^{241}Pu	3E-02 (*8E-03 to 7E-02*)	2E+01	7E+00	3E-05	9E-01	4E-02	3E-02
^{242}Pu	9E-07 (*8E-08 to 4E-06*)	1E-04	9E-05	2E-10	8E-06	3E-07	3E-07

[1] **Average sludge waste concentration value (*range of concentration*)**

[2] **B200/T200 series tanks include: B-201, B-202, B-203, B-204, T-201, T-202, T-203, T-204**

Originator: Brian Thompson
Date: November 18, 2011
Revision: 0
Reviewer: Jacob Reynolds Jacob Reynolds
Review Date: 11/21/11

Purpose

Compare adjusted concentrations [μCi/g-sludge] of select analytes in tanks:

- 241-AZ-101
- 241-B-101
- 241-B-103
- 241-T-101
- 241-T-102
- 241-T-103

with average adjusted concentrations [μCi/g-sludge] in tanks containing potential TRU wastes:

- 241-B-201
- 241-B-202
- 241-B-203
- 241-B-204
- 241-T-104
- 241-T-110
- 241-T-111
- 241-T-200
- 241-T-201
- 241-T-202
- 241-T-203
- 241-T-204

Approach

(1) Determine adjusted analyte activity for each sludge waste phase present in each tank using the adjusted analyte concentration, waste phase volume, and component density as represented in the TWINS database

(2) Sum individual adjusted analyte activities for all sludge waste phases per tank and divide by total sludge mass to determine adjusted analyte concentration [μCi/g-sludge]

Inputs

(1) Define units

$kL := 1000L \qquad \mu := 10^{-6} \qquad Ci := 3.7\ 10^{10} Bq$

(2) Define matrix notation

$i := 0..24 \qquad j := 0..19$

(3) Tank waste phases

Reference :=

0	"241-AZ-101"	"Sludge (Liquid & Solid)"	"NA (solid)"
1	"241-AZ-101"	"Sludge (Liquid & Solid)"	"P3AZ1 (solid)"
2	"241-B-101"	"Sludge (Liquid & Solid)"	"B (solid)"
3	"241-B-101"	"Sludge (Liquid & Solid)"	"BL (solid)"
4	"241-B-101"	"Sludge (Liquid & Solid)"	"MW1 (solid)"
5	"241-B-103"	"Sludge (Liquid & Solid)"	"MW1 (solid)"
6	"241-T-101"	"Sludge (Liquid & Solid)"	"CWR2 (solid)"
7	"241-T-102"	"Sludge (Liquid & Solid)"	"CWP2 (solid)"
8	"241-T-102"	"Sludge (Liquid & Solid)"	"MW2 (solid)"
9	"241-T-103"	"Sludge (Liquid & Solid)"	"CWP2 (solid)"
10	"241-T-103"	"Sludge (Liquid & Solid)"	"CWR1 (solid)"
11	"241-T-103"	"Sludge (Liquid & Solid)"	"MW2 (solid)"
12	"241-B-201"	"Sludge (Liquid & Solid)"	"224-1 (solid)"
13	"241-B-202"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
14	"241-B-203"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
15	"241-B-204"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
16	"241-T-104"	"Sludge (Liquid & Solid)"	"1C (solid)"
17	"241-T-110"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
18	"241-T-110"	"Sludge (Liquid & Solid)"	"2C (solid)"
19	"241-T-111"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
20	"241-T-111"	"Sludge (Liquid & Solid)"	"2C (solid)"
21	"241-T-201"	"Sludge (Liquid & Solid)"	"224-1 (solid)"
22	"241-T-202"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
23	"241-T-203"	"Sludge (Liquid & Solid)"	"224-2 (solid)"
24	"241-T-204"	"Sludge (Liquid & Solid)"	"224-2 (solid)"

Source: Tank Waste Information Network System (TWINS), Queried 11/03/2011 [Tank waste phase], http://twins.pnl.gov/twins.htm.

(4) Waste phase volume and component density (corresponding to 'reference' in (3))

$$\text{Volume} := \begin{pmatrix} 30 \\ 167 \\ 19 \\ 76 \\ 11 \\ 4 \\ 140 \\ 64 \\ 8 \\ 64 \\ 19 \\ 4 \\ 111 \\ 108 \\ 188 \\ 184 \\ 1199 \\ 37 \\ 1360 \\ 904 \\ 787 \\ 107 \\ 77 \\ 136 \\ 136 \end{pmatrix} \mathrm{kL} \qquad \rho := \begin{pmatrix} 1.59 \\ 1.59 \\ 1.74 \\ 1.5 \\ 1.8 \\ 1.8 \\ 1.46 \\ 1.79 \\ 1.85 \\ 1.68 \\ 1.8 \\ 1.85 \\ 1.26 \\ 1.22 \\ 1.19 \\ 1.19 \\ 1.29 \\ 1.25 \\ 1.25 \\ 1.24 \\ 1.24 \\ 1.31 \\ 1.18 \\ 1.22 \\ 1.18 \end{pmatrix} \frac{\mathrm{gm}}{\mathrm{mL}}$$

Source: Tank Waste Information Network System (TWINS), Queried 11/03/2011 [Volume (kL), component density (g/mL), primary reported values], http://twins.pnl.gov/twins.htm.

(5) Adjusted concentration of select analytes (corresponding 'reference' in (3))

Analytes := (units: $\frac{\mu \cdot Ci}{gm}$)

^{129}I	^{137}Cs	^{137m}Ba	^{14}C	^{151}Sm	^{90}Sr	^{90}Y	^{99}Tc	^{233}U	^{234}U	^{235}U	^{236}U	^{237}Np	^{238}Pu	^{238}U	^{239}Pu	^{240}Pu	^{241}Am	^{241}Pu	^{242}Pu
1.10E-03	7.13E+02	6.73E+02	1.10E-03	7.00E+00	1.53E+04	1.53E+04	1.62E-01	3.04E-03	2.15E-03	9.57E-05	2.84E-04	4.10E-02	4.56E-01	1.68E-03	3.63E+00	9.46E-01	7.76E+01	1.37E+01	1.00E-04
1.10E-03	7.13E+02	6.73E+02	1.10E-03	4.30E+02	1.53E+04	1.53E+04	1.62E-01	2.72E-07	2.44E-03	9.57E-05	2.84E-04	4.10E-02	4.56E-01	1.68E-03	3.56E+00	1.02E+00	7.77E+01	2.18E+01	1.32E-04
1.24E-06	4.86E+00	4.59E+00	2.83E-04	8.20E+02	5.44E+03	5.44E+03	2.01E-02	1.04E-06	9.95E-03	4.30E-04	4.89E-04	5.92E-05	6.34E-01	7.49E-03	5.93E+00	2.08E+00	4.27E+01	2.81E+01	3.54E-04
2.29E-07	0.00E+00	0.00E+00	5.67E-05	1.60E+00	2.89E+01	2.89E+01	3.74E-03	5.08E-07	1.97E-03	8.35E-05	5.93E-05	1.15E-05	4.77E-02	1.85E-03	8.97E-01	2.29E-01	5.98E-02	1.84E+00	2.21E-05
4.56E-07	1.79E+00	1.69E+00	8.23E-05	7.64E-02	3.50E+01	3.50E+01	1.03E-03	6.60E-08	8.53E-02	3.85E-03	7.28E-04	5.81E-06	1.98E-06	8.68E-02	6.05E-04	4.08E-05	1.25E-04	2.82E-05	1.85E-10
4.56E-07	1.79E+00	1.69E+00	8.23E-05	7.64E-02	3.50E+01	3.50E+01	1.03E-03	6.60E-08	8.53E-02	3.85E-03	7.28E-04	5.81E-06	1.98E-06	8.68E-02	6.05E-04	4.08E-05	1.25E-04	2.82E-05	1.85E-10
3.15E-07	5.71E-01	5.39E-01	9.78E-04	2.07E-02	4.88E-01	4.88E-01	2.24E-04	1.65E-08	9.53E-03	3.62E-04	2.68E-04	1.46E-06	2.17E-02	6.64E-03	8.97E-01	1.97E-01	8.67E-02	9.07E-01	8.36E-06
1.40E-04	1.67E+01	1.57E+01	3.38E-02	1.51E-02	1.23E+02	1.23E+02	1.30E-02	1.25E-02	1.77E-04	7.75E-06	4.33E-06	3.92E-04	7.45E-04	1.72E-04	3.25E-02	7.68E-03	1.84E-01	3.96E-02	3.90E-07
1.03E-06	1.76E+00	1.66E+00	4.14E-04	6.50E-02	6.89E+01	6.89E+01	9.04E-04	9.96E-08	8.32E-02	3.68E-03	1.13E-03	5.20E-06	4.75E-05	8.50E-02	5.66E-03	7.17E-04	3.75E-04	1.13E-03	1.15E-08
1.15E-04	3.52E-01	3.33E-01	7.02E-04	1.24E-02	2.98E-01	2.98E-01	1.32E-04	1.03E-02	1.42E-03	5.54E-05	3.50E-05	8.78E-07	7.46E-04	1.28E-03	3.26E-02	7.69E-03	4.14E-03	3.97E-02	3.91E-07
2.08E-07	3.58E+00	3.38E+00	2.50E-04	1.35E-02	1.69E+00	1.69E+00	2.93E-03	1.10E-09	5.67E-04	2.41E-05	1.16E-05	9.79E-07	4.57E-05	5.54E-04	3.03E-03	5.76E-04	1.95E-03	1.51E-03	1.71E-08
1.03E-06	1.76E+00	1.66E+00	4.14E-04	6.50E-02	6.89E+01	6.89E+01	9.04E-04	9.96E-08	8.32E-02	3.68E-03	1.13E-03	5.20E-06	4.75E-05	8.50E-02	5.66E-03	7.17E-04	3.75E-04	1.13E-03	1.15E-08
5.47E-12	1.24E-01	1.17E-01	1.36E-07	4.05E-03	1.55E+00	1.55E+00	1.23E-08	3.95E-11	5.17E-05	2.29E-06	5.35E-07	1.48E-07	6.09E-03	5.21E-05	7.51E-01	4.32E-02	2.83E-02	7.65E-03	2.58E-06
0.00E+00	6.96E-02	6.57E-02	1.97E-07	5.76E-03	2.72E+00	2.72E+00	5.20E-03	1.26E-10	1.41E-04	4.82E-06	1.52E-06	2.21E-07	1.97E-03	1.08E-04	1.28E-01	2.17E-02	6.67E-02	6.58E-02	4.24E-06
0.00E+00	6.04E-03	5.70E-03	1.98E-07	5.81E-03	6.28E-02	6.28E-02	1.82E-08	3.25E-12	2.71E-06	1.20E-07	3.69E-08	8.17E-07	1.96E-03	2.78E-06	2.34E-01	2.94E-02	3.47E-02	4.63E-02	4.72E-07
0.00E+00	2.39E-02	2.25E-02	1.85E-07	5.43E-03	2.38E-03	2.38E-03	1.70E-08	2.37E-15	1.98E-09	8.76E-11	2.69E-11	2.08E-07	1.67E-03	2.02E-09	1.99E-01	2.51E-02	3.84E-02	3.95E-02	4.02E-07
3.30E-07	1.42E-01	1.34E-01	4.46E-05	6.34E-02	1.84E+00	1.84E+00	6.30E-04	3.04E-10	4.06E-04	1.31E-05	3.92E-06	1.42E-06	1.57E-03	3.00E-04	1.25E-01	1.51E-02	1.83E-02	4.18E-02	7.44E-07
0.00E+00	1.36E-02	1.28E-02	2.00E-07	5.86E-03	2.48E-02	2.48E-02	1.84E-08	8.37E-12	6.99E-06	3.10E-07	9.51E-08	3.13E-05	4.61E-04	7.16E-06	5.50E-02	6.94E-03	4.99E-03	1.09E-02	1.11E-07
1.49E-10	1.36E-02	1.28E-02	1.31E-06	1.16E-02	2.48E-02	2.48E-02	7.09E-07	6.62E-12	7.01E-06	3.14E-07	7.42E-08	3.13E-05	3.61E-04	7.14E-06	5.61E-02	5.85E-03	4.97E-03	7.89E-03	7.66E-08
0.00E+00	9.28E-02	8.76E-02	2.01E-07	5.91E-03	3.71E+00	3.71E+00	7.92E-03	1.38E-09	1.15E-03	5.11E-05	1.57E-05	2.26E-07	1.03E-03	1.18E-03	1.23E-01	1.55E-02	4.70E-02	2.44E-02	2.49E-07
1.50E-10	9.28E-02	8.76E-02	1.33E-06	1.17E-02	3.71E+00	3.71E+00	7.92E-03	1.09E-09	1.16E-03	5.17E-05	1.22E-05	2.93E-07	7.67E-05	1.18E-03	1.26E-01	1.31E-02	4.67E-02	1.77E-02	1.71E-07
4.97E-12	2.02E-02	1.91E-02	1.24E-07	3.67E-03	6.11E-02	6.11E-02	1.12E-08	1.65E-15	2.14E-09	9.65E-11	1.83E-11	1.34E-07	2.20E-03	2.18E-09	6.71E-01	4.52E-02	3.96E-02	3.12E-02	2.04E-07
0.00E+00	6.17E-03	5.82E-03	1.97E-07	5.79E-03	2.03E-03	2.03E-03	1.81E-08	4.17E-11	3.48E-05	1.54E-06	4.74E-07	2.22E-07	1.40E-03	3.57E-05	1.67E-01	2.11E-02	3.23E-02	3.32E-02	3.38E-07
0.00E+00	6.07E-03	5.73E-03	1.94E-07	5.69E-03	2.01E-03	2.01E-03	1.78E-08	1.26E-12	1.05E-06	4.66E-08	1.43E-08	6.91E-07	1.87E-03	1.08E-06	2.23E-01	2.81E-02	3.76E-02	4.43E-02	4.51E-07
0.00E+00	6.24E-03	5.89E-03	2.04E-07	5.98E-03	3.66E-03	3.66E-03	1.87E-08	4.39E-13	3.67E-07	1.63E-08	4.99E-09	6.03E-07	1.59E-03	3.76E-07	1.90E-01	2.39E-02	2.28E-02	3.76E-02	3.83E-07

Source: Tank Waste Information Network System (TWINS), Queried 11/03/2011 [Select tanks and analytes, adjusted concentration, μCi/g], http://twins.pnl.gov/twins.htm.

Equations

(1) Calculate analyte inventory for each analyte in each waste phase

$$\mathrm{Inventory}_{i,j} := \overrightarrow{\mathrm{Analytes}_{i,j} \cdot \mathrm{Volume}_i \cdot \rho_i}$$

Example Calculation

Tank: 241-AZ-101
Analyte: ^{129}I
Waste Phase: Sludge (Liquid & Solid) => NA (Sludge)

$$Inventory = 1.10 \cdot 10^{-3} \frac{\mu Ci}{g} \cdot 30kL \cdot 1.59 \frac{g}{mL} \cdot \frac{1000L}{kL} \cdot \frac{1000mL}{L} = 5.25 \cdot 10^{4} \mu Ci$$

(2) Mass of each sludge phase per tank

$$m_{\mathrm{phase}_i} := \overrightarrow{\mathrm{Volume}_i \cdot \rho_i}$$

Example Calculation

Tank: 241-AZ-101
Waste Phase: Sludge (Liquid & Solid) => NA (Sludge)

$$Mass = 30kL \cdot 1.59 \frac{g}{mL} \cdot \frac{1000L}{kL} \cdot \frac{1000mL}{L} = 4.77 \cdot 10^{7} g$$

(3) Adjusted analyte concentrations per total sludge waste

$$\mathrm{AZ101}_j := \frac{\mathrm{Inventory}_{0,j} + \mathrm{Inventory}_{1,j}}{m_{\mathrm{phase}_0} + m_{\mathrm{phase}_1}}$$

$$\mathrm{B101}_j := \frac{\mathrm{Inventory}_{2,j} + \mathrm{Inventory}_{3,j} + \mathrm{Inventory}_{4,j}}{m_{\mathrm{phase}_2} + m_{\mathrm{phase}_3} + m_{\mathrm{phase}_4}}$$

$$\mathrm{B103}_j := \mathrm{Analytes}_{5,j}$$

$$\mathrm{T102}_j := \frac{\mathrm{Inventory}_{7,j} + \mathrm{Inventory}_{8,j}}{m_{\mathrm{phase}_7} + m_{\mathrm{phase}_8}}$$

$$\mathrm{T101}_j := \mathrm{Analytes}_{6,j}$$

$$\mathrm{T103}_j := \frac{\mathrm{Inventory}_{9,j} + \mathrm{Inventory}_{10,j} + \mathrm{Inventory}_{11,j}}{m_{\mathrm{phase}_9} + m_{\mathrm{phase}_{10}} + m_{\mathrm{phase}_{11}}}$$

$B201_j := Analytes_{12,j}$

$B202_j := Analytes_{13,j}$

$B203_j := Analytes_{14,j}$

$B204_j := Analytes_{15,j}$

$T201_j := Analytes_{21,j}$

$T202_j := Analytes_{22,j}$

$T203_j := Analytes_{23,j}$

$T204_j := Analytes_{24,j}$

$T104_j := Analytes_{16,j}$

$$T110_j := \frac{Inventory_{17,j} + Inventory_{18,j}}{m_{phase_{17}} + m_{phase_{18}}}$$

$$T111_j := \frac{Inventory_{19,j} + Inventory_{20,j}}{m_{phase_{19}} + m_{phase_{20}}}$$

Example Calculation

Tank: 241-AZ-101

$$AZ101 = \frac{5.25 \cdot 10^4 \mu Ci + 2.92 \cdot 10^5 \mu Ci}{4.77 \cdot 10^7 g + 2.66 \cdot 10^8 g} = 1.10 \cdot 10^{-3} \frac{\mu Ci}{g(sludge)}$$

(4) Adjusted analyte concentrations for all tanks containing potential TRU wastes

$$TRU := B201 + B202 + B203 + B204 + T104 + T110 + T111 + T201 + T202 + T203 + T204$$

Example Calculation
Analyte: ^{129}I

$$TRU = 5 \cdot 10^{-12} + 0 + 0 + 0 + 3 \cdot 10^{-7} + 1 \cdot 10^{-10} + 7 \cdot 10^{-11} + 5 \cdot 10^{-12} + 5 \cdot 10^{-12} + 0 + 0 + 0$$
$$= 3 \cdot 10^{-7} \frac{\mu Ci}{g\ (solids)}$$

Results

(1) Adjusted analyte concentrations for all tanks

	AZ101 = ($\mu\cdot Ci/gm$)	B101= ($\mu\cdot Ci/gm$)	B103= ($\mu\cdot Ci/gm$)	T101 = ($\mu\cdot Ci/gm$)	T102 = ($\mu\cdot Ci/gm$)
"129I"	1E-003	5E-007	5E-007	3E-007	1E-004
"137Cs"	7E+002	1E+000	2E+000	6E-001	1E+001
"137mBa"	7E+002	1E+000	2E+000	5E-001	1E+001
"14C"	1E-003	1E-004	8E-005	10E-004	3E-002
"151Sm"	4E+002	2E+002	8E-002	2E-002	2E-002
"90Sr"	2E+004	1E+003	4E+001	5E-001	1E+002
"90Y"	2E+004	1E+003	4E+001	5E-001	1E+002
"99Tc"	2E-001	7E-003	1E-003	2E-004	1E-002
"233U"	5E-004	6E-007	7E-008	2E-008	1E-002
"234U"	2E-003	1E-002	9E-002	10E-003	10E-003
"235U"	10E-005	6E-004	4E-003	4E-004	4E-004
"236U"	3E-004	2E-004	7E-004	3E-004	1E-004
"237Np"	4E-002	2E-005	6E-006	1E-006	3E-004
"238Pu"	5E-001	2E-001	2E-006	2E-002	7E-004
"238U"	2E-003	1E-002	9E-002	7E-003	10E-003
"239Pu"	4E+000	2E+000	6E-004	9E-001	3E-002
"240Pu"	1E+000	6E-001	4E-005	2E-001	7E-003
"241Am"	8E+001	9E+000	1E-004	9E-002	2E-001
"241Pu"	2E+001	7E+000	3E-005	9E-001	4E-002
"242Pu"	1E-004	9E-005	2E-010	8E-006	3E-007

$$\begin{pmatrix} \text{"129I"} \\ \text{"137Cs"} \\ \text{"137mBa"} \\ \text{"14C"} \\ \text{"151Sm"} \\ \text{"90Sr"} \\ \text{"90Y"} \\ \text{"99Tc"} \\ \text{"233U"} \\ \text{"234U"} \\ \text{"235U"} \\ \text{"236U"} \\ \text{"237Np"} \\ \text{"238Pu"} \\ \text{"238U"} \\ \text{"239Pu"} \\ \text{"240Pu"} \\ \text{"241Am"} \\ \text{"241Pu"} \\ \text{"242Pu"} \end{pmatrix}$$

$$T103 = \begin{pmatrix} 8E\text{-}005 \\ 1E{+}000 \\ 1E{+}000 \\ 6E\text{-}004 \\ 2E\text{-}002 \\ 4E{+}000 \\ 4E{+}000 \\ 8E\text{-}004 \\ 7E\text{-}003 \\ 5E\text{-}003 \\ 2E\text{-}004 \\ 8E\text{-}005 \\ 1E\text{-}006 \\ 6E\text{-}004 \\ 5E\text{-}003 \\ 2E\text{-}002 \\ 6E\text{-}003 \\ 3E\text{-}003 \\ 3E\text{-}002 \\ 3E\text{-}007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$B201 = \begin{pmatrix} 5E\text{-}012 \\ 1E\text{-}001 \\ 1E\text{-}001 \\ 1E\text{-}007 \\ 4E\text{-}003 \\ 2E{+}000 \\ 2E{+}000 \\ 1E\text{-}008 \\ 4E\text{-}011 \\ 5E\text{-}005 \\ 2E\text{-}006 \\ 5E\text{-}007 \\ 1E\text{-}007 \\ 6E\text{-}003 \\ 5E\text{-}005 \\ 8E\text{-}001 \\ 4E\text{-}002 \\ 3E\text{-}002 \\ 8E\text{-}003 \\ 3E\text{-}006 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$B202 = \begin{pmatrix} 0E{+}000 \\ 7E\text{-}002 \\ 7E\text{-}002 \\ 2E\text{-}007 \\ 6E\text{-}003 \\ 3E{+}000 \\ 3E{+}000 \\ 5E\text{-}003 \\ 1E\text{-}010 \\ 1E\text{-}004 \\ 5E\text{-}006 \\ 2E\text{-}006 \\ 2E\text{-}007 \\ 2E\text{-}003 \\ 1E\text{-}004 \\ 1E\text{-}001 \\ 2E\text{-}002 \\ 7E\text{-}002 \\ 7E\text{-}002 \\ 4E\text{-}006 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$B203 = \begin{pmatrix} 0E{+}000 \\ 6E\text{-}003 \\ 6E\text{-}003 \\ 2E\text{-}007 \\ 6E\text{-}003 \\ 6E\text{-}002 \\ 6E\text{-}002 \\ 2E\text{-}008 \\ 3E\text{-}012 \\ 3E\text{-}006 \\ 1E\text{-}007 \\ 4E\text{-}008 \\ 8E\text{-}007 \\ 2E\text{-}003 \\ 3E\text{-}006 \\ 2E\text{-}001 \\ 3E\text{-}002 \\ 3E\text{-}002 \\ 5E\text{-}002 \\ 5E\text{-}007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$B204 = \begin{pmatrix} 0E{+}000 \\ 2E\text{-}002 \\ 2E\text{-}002 \\ 2E\text{-}007 \\ 5E\text{-}003 \\ 2E\text{-}003 \\ 2E\text{-}003 \\ 2E\text{-}008 \\ 2E\text{-}015 \\ 2E\text{-}009 \\ 9E\text{-}011 \\ 3E\text{-}011 \\ 2E\text{-}007 \\ 2E\text{-}003 \\ 2E\text{-}009 \\ 2E\text{-}001 \\ 3E\text{-}002 \\ 4E\text{-}002 \\ 4E\text{-}002 \\ 4E\text{-}007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

Units: $\frac{\mu \cdot Ci}{gm}$

	T104 =	T110 =	T111 =	T201 =	T202 =
"129I"	3E-007	1E-010	7E-011	5E-012	0E+000
"137Cs"	1E-001	1E-002	9E-002	2E-002	6E-003
"137mBa"	1E-001	1E-002	9E-002	2E-002	6E-003
"14C"	4E-005	1E-006	7E-007	1E-007	2E-007
"151Sm"	6E-002	1E-002	9E-003	4E-003	6E-003
"90Sr"	2E+000	2E-002	4E+000	6E-002	2E-003
"90Y"	2E+000	2E-002	4E+000	6E-002	2E-003
"99Tc"	6E-004	7E-007	8E-003	1E-008	2E-008
"233U"	3E-010	7E-012	1E-009	2E-015	4E-011
"234U"	4E-004	7E-006	1E-003	2E-009	3E-005
"235U"	1E-005	3E-007	5E-005	10E-011	2E-006
"236U"	4E-006	7E-008	1E-005	2E-011	5E-007
"237Np"	1E-006	3E-005	3E-007	1E-007	2E-007
"238Pu"	2E-003	4E-004	6E-004	2E-003	1E-003
"238U"	3E-004	7E-006	1E-003	2E-009	4E-005
"239Pu"	1E-001	6E-002	1E-001	7E-001	2E-001
"240Pu"	2E-002	6E-003	1E-002	5E-002	2E-002
"241Am"	2E-002	5E-003	5E-002	4E-002	3E-002
"241Pu"	4E-002	8E-003	2E-002	3E-002	3E-002
"242Pu"	7E-007	8E-008	2E-007	2E-007	3E-007

$$\begin{pmatrix} \text{"129I"} \\ \text{"137Cs"} \\ \text{"137mBa"} \\ \text{"14C"} \\ \text{"151Sm"} \\ \text{"90Sr"} \\ \text{"90Y"} \\ \text{"99Tc"} \\ \text{"233U"} \\ \text{"234U"} \\ \text{"235U"} \\ \text{"236U"} \\ \text{"237Np"} \\ \text{"238Pu"} \\ \text{"238U"} \\ \text{"239Pu"} \\ \text{"240Pu"} \\ \text{"241Am"} \\ \text{"241Pu"} \\ \text{"242Pu"} \end{pmatrix} \qquad T203 = \begin{pmatrix} 0E+000 \\ 6E-003 \\ 6E-003 \\ 2E-007 \\ 6E-003 \\ 2E-003 \\ 2E-003 \\ 2E-008 \\ 1E-012 \\ 1E-006 \\ 5E-008 \\ 1E-008 \\ 7E-007 \\ 2E-003 \\ 1E-006 \\ 2E-001 \\ 3E-002 \\ 4E-002 \\ 4E-002 \\ 5E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \qquad T204 = \begin{pmatrix} 0E+000 \\ 6E-003 \\ 6E-003 \\ 2E-007 \\ 6E-003 \\ 4E-003 \\ 4E-003 \\ 2E-008 \\ 4E-013 \\ 4E-007 \\ 2E-008 \\ 5E-009 \\ 6E-007 \\ 2E-003 \\ 4E-007 \\ 2E-001 \\ 2E-002 \\ 2E-002 \\ 4E-002 \\ 4E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

INTEROFFICE MEMORANDUM washington river protection solutions

WRPS-1105653

Date: December 27, 2011

To: A.R. Tedeschi, B1-55

From: B.R. Thompson, B1-55

Subject: SELECT TANK ANALYTE CONCENTRATIONS IN SUPPORT OF CH-TRU PERMIT MODIFICATION

Reference: 1. Tank Waste Information Network System (TWINS), Queried 11/03/11 http://twins.pnl.gov/twins.htm

Enclosed is a table comparing adjusted analyte concentrations in sludge waste for tanks AZ-101, B-101, B-103, T-101, T-102, and T-103 with the average adjusted analyte concentrations in sludge waste for tanks containing potential TRU waste (B200 series, T200 series, T-104, T-110, T-111).

Calculations to determine adjusted analyte concentration per total sludge mass in each tank are documented in the attached informal calculation. All inputs used in the calculations were obtained from the Best-Basis Inventory from the Tank Waste Information Network System (TWINS) database [1].

Let me know if you have questions.

BRT

Enclosure Adjusted Analyte Concentrations.pdf
Summary Table of Adjusted Analyte Concentrations.docx

APPROVAL:

Jacob Reynolds 12/27/11

J.G. Reynolds Date
Manager, Tank Waste Inventory & Characterization

cc: J.G. Reynolds, B1-55

Table 1 – Summary of adjusted analyte concentration in sludge waste

	Sludge Waste[1] [µCi/g]	HLW Sludge [µCi/g]					
Analyte	**B200/T200 Series[2], T-104, T-110, T-111**	**AZ-101**	**B-101**	**B-103**	**T-101**	**T-102**	**T-103**
^{129}I	3E-08 (*0E+00 to 3E-07*)	1E-03	5E-07	5E-07	3E-07	1E-04	8E-05
^{137}Cs	5E-02 (*6E-03 to 1E-01*)	7E+02	1E+00	2E+00	6E-01	1E+01	1E+00
^{137m}Ba	4E-02 (*6E-03 to 1E-01*)	7E+02	1E+00	2E+00	5E-01	1E+01	1E+00
^{14}C	4E-06 (*1E-07 to 4E-05*)	1E-03	1E-04	8E-05	10E-04	3E-02	6E-04
^{151}Sm	1E-02 (*4E-03 to 6E-02*)	4E+02	2E+02	8E-02	2E-02	2E-02	2E-02
^{90}Sr	9E-01 (*2E-03 to 4E+00*)	2E+04	1E+03	4E+01	5E-01	1E+02	4E+00
^{90}Y	9E-01 (*2E-03 to 4E+00*)	2E+04	1E+03	4E+01	5E-01	1E+02	4E+00
^{99}Tc	1E-03 (*1E-08 to 8E-03*)	2E-01	7E-03	1E-03	2E-04	1E-02	8E-04
^{233}U	2E-10 (*2E-15 to 1E-09*)	5E-04	6E-07	7E-08	2E-08	1E-02	7E-03
^{234}U	2E-04 (*2E-09 to 1E-03*)	2E-03	1E-02	9E-02	10E-03	10E-03	5E-03
^{235}U	7E-06 (*9E-11 to 5E-05*)	10E-05	6E-04	4E-03	4E-04	4E-04	2E-04
^{236}U	2E-06 (*2E-11 to 1E-05*)	3E-04	2E-04	7E-04	3E-04	1E-04	8E-05
^{237}Np	3E-06 (*1E-07 to 3E-05*)	4E-02	2E-05	6E-06	1E-06	3E-04	1E-06
^{238}Pu	2E-03 (*4E-04 to 6E-03*)	5E-01	2E-01	2E-06	2E-02	7E-04	6E-04
^{238}U	2E-04 (*2E-09 to 1E-03*)	2E-03	1E-02	9E-02	7E-03	10E-03	5E-03
^{239}Pu	3E-01 (*6E-02 to 8E-01*)	4E+00	2E+00	6E-04	9E-01	3E-02	2E-02
^{240}Pu	2E-02 (*6E-03 to 5E-02*)	1E+00	6E-01	4E-05	2E-01	7E-03	6E-03
^{241}Am	3E-02 (*5E-03 to7E-02*)	8E+01	9E+00	1E-04	9E-02	2E-01	3E-03
^{241}Pu	3E-02 (*8E-03 to 7E-02*)	2E+01	7E+00	3E-05	9E-01	4E-02	3E-02
^{242}Pu	9E-07 (*8E-08 to 4E-06*)	1E-04	9E-05	2E-10	8E-06	3E-07	3E-07

[1] Average sludge waste concentration value (*range of concentration*)

[2] B200/T200 series tanks include: B-201, B-202, B-203, B-204, T-201, T-202, T-203, T-204

Originator: Brian Thompson
Date: December 27, 2011
Revision: 1
Reviewer: Jacob Reynolds Jacob Reynolds
Review Date: 12/27/11

Purpose

Compare adjusted concentrations [µCi/g-sludge] of select analytes in tanks:

- 241-AZ-101
- 241-B-101
- 241-B-103
- 241-T-101
- 241-T-102
- 241-T-103

with average adjusted concentrations [µCi/g-sludge] in tanks containing potential TRU wastes:

- 241-B-201
- 241-B-202
- 241-B-203
- 241-B-204
- 241-T-104
- 241-T-110
- 241-T-111
- 241-T-201
- 241-T-202
- 241-T-203
- 241-T-204

Approach

(1) Determine adjusted analyte activity for each sludge waste phase present in each tank using the adjusted analyte concentration, waste phase volume, and component density as represented in the TWINS database

(2) Sum individual adjusted analyte activities for all sludge waste phases per tank and divide by total sludge mass to determine adjusted analyte concentration [µCi/g-sludge]

Inputs

(1) Define units

$kL := 1000L \qquad \mu := 10^{-6} \qquad Ci := 3.7\ 10^{10} Bq$

(2) Define matrix notation

$i := 0..24 \qquad j := 0..19$

(3) Tank waste phases

$$Reference := \begin{pmatrix} 0 & \text{"241-AZ-101"} & \text{"Sludge (Liquid \& Solid)"} & \text{"NA (solid)"} \\ 1 & \text{"241-AZ-101"} & \text{"Sludge (Liquid \& Solid)"} & \text{"P3AZ1 (solid)"} \\ 2 & \text{"241-B-101"} & \text{"Sludge (Liquid \& Solid)"} & \text{"B (solid)"} \\ 3 & \text{"241-B-101"} & \text{"Sludge (Liquid \& Solid)"} & \text{"BL (solid)"} \\ 4 & \text{"241-B-101"} & \text{"Sludge (Liquid \& Solid)"} & \text{"MW1 (solid)"} \\ 5 & \text{"241-B-103"} & \text{"Sludge (Liquid \& Solid)"} & \text{"MW1 (solid)"} \\ 6 & \text{"241-T-101"} & \text{"Sludge (Liquid \& Solid)"} & \text{"CWR2 (solid)"} \\ 7 & \text{"241-T-102"} & \text{"Sludge (Liquid \& Solid)"} & \text{"CWP2 (solid)"} \\ 8 & \text{"241-T-102"} & \text{"Sludge (Liquid \& Solid)"} & \text{"MW2 (solid)"} \\ 9 & \text{"241-T-103"} & \text{"Sludge (Liquid \& Solid)"} & \text{"CWP2 (solid)"} \\ 10 & \text{"241-T-103"} & \text{"Sludge (Liquid \& Solid)"} & \text{"CWR1 (solid)"} \\ 11 & \text{"241-T-103"} & \text{"Sludge (Liquid \& Solid)"} & \text{"MW2 (solid)"} \\ 12 & \text{"241-B-201"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-1 (solid)"} \\ 13 & \text{"241-B-202"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 14 & \text{"241-B-203"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 15 & \text{"241-B-204"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 16 & \text{"241-T-104"} & \text{"Sludge (Liquid \& Solid)"} & \text{"1C (solid)"} \\ 17 & \text{"241-T-110"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 18 & \text{"241-T-110"} & \text{"Sludge (Liquid \& Solid)"} & \text{"2C (solid)"} \\ 19 & \text{"241-T-111"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 20 & \text{"241-T-111"} & \text{"Sludge (Liquid \& Solid)"} & \text{"2C (solid)"} \\ 21 & \text{"241-T-201"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-1 (solid)"} \\ 22 & \text{"241-T-202"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 23 & \text{"241-T-203"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \\ 24 & \text{"241-T-204"} & \text{"Sludge (Liquid \& Solid)"} & \text{"224-2 (solid)"} \end{pmatrix}$$

Source: Tank Waste Information Network System (TWINS), Queried 11/03/2011 [Tank waste phase], http://twins.pnl.gov/twins.htm.

(4) Waste phase volume and component density (corresponding to 'reference' in (3))

$$\text{Volume} := \begin{pmatrix} 30 \\ 167 \\ 19 \\ 76 \\ 11 \\ 4 \\ 140 \\ 64 \\ 8 \\ 64 \\ 19 \\ 4 \\ 111 \\ 108 \\ 188 \\ 184 \\ 1199 \\ 37 \\ 1360 \\ 904 \\ 787 \\ 107 \\ 77 \\ 136 \\ 136 \end{pmatrix} \text{kL} \qquad \rho := \begin{pmatrix} 1.59 \\ 1.59 \\ 1.74 \\ 1.5 \\ 1.8 \\ 1.8 \\ 1.46 \\ 1.79 \\ 1.85 \\ 1.68 \\ 1.8 \\ 1.85 \\ 1.26 \\ 1.22 \\ 1.19 \\ 1.19 \\ 1.29 \\ 1.25 \\ 1.25 \\ 1.24 \\ 1.24 \\ 1.31 \\ 1.18 \\ 1.22 \\ 1.18 \end{pmatrix} \frac{\text{gm}}{\text{mL}}$$

Source: Tank Waste Information Network System (TWINS), Queried 11/03/2011 [Volume (kL), component density (g/mL), primary reported values], http://twins.pnl.gov/twins.htm.

(5) Adjusted concentration of select analytes (corresponding 'reference' in (3))

Analytes := (units: $\frac{\mu \cdot Ci}{gm}$)

^{129}I	^{137}Cs	^{137m}Ba	^{14}C	^{151}Sm	^{90}Sr	^{90}Y	^{99}Tc	^{233}U	^{234}U	^{235}U	^{236}U	^{237}Np	^{238}Pu	^{238}U	^{239}Pu	^{240}Pu	^{241}Am	^{241}Pu	^{242}Pu
1.10E-03	7.13E+02	6.73E+02	1.10E-03	7.00E+00	1.53E+04	1.53E+04	1.62E-01	3.04E-03	2.15E-03	9.57E-05	2.84E-04	4.10E-02	4.56E-01	1.68E-03	3.63E+00	9.46E-01	7.76E+01	1.37E+01	1.00E-04
1.10E-03	7.13E+02	6.73E+02	1.10E-03	4.30E+02	1.53E+04	1.53E+04	1.62E-01	2.72E-07	2.44E-03	9.57E-05	2.84E-04	4.10E-02	4.56E-01	1.68E-03	3.56E+00	1.02E+00	7.77E+01	2.18E+01	1.32E-04
1.24E-06	4.86E+00	4.59E+00	2.83E-04	8.20E+02	5.44E+03	5.44E+03	2.01E-02	1.04E-06	9.95E-03	4.30E-04	4.89E-04	5.92E-05	6.34E-01	7.49E-03	5.93E+00	2.08E+00	4.27E+01	2.81E+01	3.54E-04
2.29E-07	0.00E+00	0.00E+00	5.67E-05	1.60E+00	2.89E+01	2.89E+01	3.74E-03	5.08E-07	1.97E-03	8.35E-05	5.93E-05	1.15E-05	4.77E-02	1.85E-03	8.97E-01	2.29E-01	5.98E-02	1.84E+00	2.21E-05
4.56E-07	1.79E+00	1.69E+00	8.23E-05	7.64E-02	3.50E+01	3.50E+01	1.03E-03	6.60E-08	8.53E-02	3.85E-03	7.28E-04	5.81E-06	1.98E-06	8.68E-02	6.05E-04	4.08E-05	1.25E-04	2.82E-05	1.85E-10
4.56E-07	1.79E+00	1.69E+00	8.23E-05	7.64E-02	3.50E+01	3.50E+01	1.03E-03	6.60E-08	8.53E-02	3.85E-03	7.28E-04	5.81E-06	1.98E-06	8.68E-02	6.05E-04	4.08E-05	1.25E-04	2.82E-05	1.85E-10
3.15E-07	5.71E-01	5.39E-01	9.78E-04	2.07E-02	4.88E-01	4.88E-01	2.24E-04	1.65E-08	9.53E-03	3.62E-04	2.68E-04	1.46E-06	2.17E-02	6.64E-03	8.97E-01	1.97E-01	8.67E-02	9.07E-01	8.36E-06
1.40E-04	1.67E+01	1.57E+01	3.38E-02	1.51E-02	1.23E+02	1.23E+02	1.30E-02	1.25E-02	1.77E-04	7.75E-06	4.33E-06	3.92E-04	7.45E-04	1.72E-04	3.25E-02	7.68E-03	1.84E-01	3.96E-02	3.90E-07
1.03E-06	1.76E+00	1.66E+00	4.14E-04	6.50E-02	6.89E+01	6.89E+01	9.04E-04	9.96E-08	8.32E-02	3.68E-03	1.13E-03	5.20E-06	4.75E-05	8.50E-02	5.66E-03	7.17E-04	3.75E-04	1.13E-03	1.15E-08
1.15E-04	3.52E-01	3.33E-01	7.02E-04	1.24E-02	2.98E-01	2.98E-01	1.32E-04	1.03E-02	1.42E-03	5.54E-05	3.50E-05	8.78E-07	7.46E-04	1.28E-03	3.26E-02	7.69E-03	4.14E-03	3.97E-02	3.91E-07
2.08E-07	3.58E+00	3.38E+00	2.50E-04	1.35E-02	1.69E+00	1.69E+00	2.93E-03	1.10E-09	5.67E-04	2.41E-05	1.16E-05	9.79E-07	4.57E-05	5.54E-04	3.03E-03	5.76E-04	1.95E-03	1.51E-03	1.71E-08
1.03E-06	1.76E+00	1.66E+00	4.14E-04	6.50E-02	6.89E+01	6.89E+01	9.04E-04	9.96E-08	8.32E-02	3.68E-03	1.13E-03	5.20E-06	4.75E-05	8.50E-02	5.66E-03	7.17E-04	3.75E-04	1.13E-03	1.15E-08
5.47E-12	1.24E-01	1.17E-01	1.36E-07	4.05E-03	1.55E+00	1.55E+00	1.23E-08	3.95E-11	5.17E-05	2.29E-06	5.35E-07	1.48E-07	6.09E-03	5.21E-05	7.51E-01	4.32E-02	2.83E-02	7.65E-03	2.58E-06
0.00E+00	6.96E-02	6.57E-02	1.97E-07	5.76E-03	2.72E+00	2.72E+00	5.20E-03	1.26E-10	1.41E-04	4.82E-06	1.52E-06	2.21E-07	1.97E-03	1.08E-04	1.28E-01	2.17E-02	6.67E-02	6.58E-02	4.24E-06
0.00E+00	6.04E-03	5.70E-03	1.98E-07	5.81E-03	6.28E-02	6.28E-02	1.82E-08	3.25E-12	2.71E-06	1.20E-07	3.69E-08	8.17E-07	1.96E-03	2.78E-06	2.34E-01	2.94E-02	3.47E-02	4.63E-02	4.72E-07
0.00E+00	2.39E-02	2.25E-02	1.85E-07	5.43E-03	2.38E-03	2.38E-03	1.70E-08	2.37E-15	1.98E-09	8.76E-11	2.69E-11	2.08E-07	1.67E-03	2.02E-09	1.99E-01	2.51E-02	3.84E-02	3.95E-02	4.02E-07
3.30E-07	1.42E-01	1.34E-01	4.46E-05	6.34E-02	1.84E+00	1.84E+00	6.30E-04	3.04E-10	4.06E-04	1.31E-05	3.92E-06	1.42E-06	1.57E-03	3.00E-04	1.25E-01	1.51E-02	1.83E-02	4.18E-02	7.44E-07
0.00E+00	1.36E-02	1.28E-02	2.00E-07	5.86E-03	2.48E-02	2.48E-02	1.84E-08	8.37E-12	6.99E-06	3.10E-07	9.51E-08	3.13E-05	4.61E-04	7.16E-06	5.50E-02	6.94E-03	4.99E-03	1.09E-02	1.11E-07
1.49E-10	1.36E-02	1.28E-02	1.31E-06	1.16E-02	2.48E-02	2.48E-02	7.09E-07	6.62E-12	7.01E-06	3.14E-07	7.42E-08	3.13E-05	3.61E-04	7.14E-06	5.61E-02	5.85E-03	4.97E-03	7.89E-03	7.66E-08
0.00E+00	9.28E-02	8.76E-02	2.01E-07	5.91E-03	3.71E+00	3.71E+00	7.92E-03	1.38E-09	1.15E-03	5.11E-05	1.57E-05	2.26E-07	1.03E-03	1.18E-03	1.23E-01	1.55E-02	4.70E-02	2.44E-02	2.49E-07
1.50E-10	9.28E-02	8.76E-02	1.33E-06	1.17E-02	3.71E+00	3.71E+00	7.92E-03	1.09E-09	1.16E-03	5.17E-05	1.22E-05	2.93E-07	7.67E-05	1.18E-03	1.26E-01	1.31E-02	4.67E-02	1.77E-02	1.71E-07
4.97E-12	2.02E-02	1.91E-02	1.24E-07	3.67E-03	6.11E-02	6.11E-02	1.12E-08	1.65E-15	2.14E-09	9.65E-11	1.83E-11	1.34E-07	2.20E-03	2.18E-09	6.71E-01	4.52E-02	3.96E-02	3.12E-02	2.04E-07
0.00E+00	6.17E-03	5.82E-03	1.97E-07	5.79E-03	2.03E-03	2.03E-03	1.81E-08	4.17E-11	3.48E-05	1.54E-06	4.74E-07	2.22E-07	1.40E-03	3.57E-05	1.67E-01	2.11E-02	3.23E-02	3.32E-02	3.38E-07
0.00E+00	6.07E-03	5.73E-03	1.94E-07	5.69E-03	2.01E-03	2.01E-03	1.78E-08	1.26E-12	1.05E-06	4.66E-08	1.43E-08	6.91E-07	1.87E-03	1.08E-06	2.23E-01	2.81E-02	3.76E-02	4.43E-02	4.51E-07
0.00E+00	6.24E-03	5.89E-03	2.04E-07	5.98E-03	3.66E-03	3.66E-03	1.87E-08	4.39E-13	3.67E-07	1.63E-08	4.99E-09	6.03E-07	1.59E-03	3.76E-07	1.90E-01	2.39E-02	2.28E-02	3.76E-02	3.83E-07

Source: Tank Waste Information Network System (TWINS), Queried 11/03/2011 [Select tanks and analytes, adjusted concentration, μCi/g], http://twins.pnl.gov/twins.htm.

Equations

(1) Calculate analyte inventory for each analyte in each waste phase

$$Inventory_{i,j} := \overrightarrow{Analytes_{i,j} \cdot Volume_i \cdot \rho_i}$$

Example Calculation

Tank: 241-AZ-101
Analyte: ^{129}I
Waste Phase: Sludge (Liquid & Solid) => NA (Sludge)

$$Inventory = 1.10 \cdot 10^{-3} \frac{\mu Ci}{g} \cdot 30kL \cdot 1.59 \frac{g}{mL} \cdot \frac{1000L}{kL} \cdot \frac{1000mL}{L} = 5.25 \cdot 10^{4} \mu Ci$$

(2) Mass of each sludge phase per tank

$$m_{phase_i} := \overrightarrow{Volume_i \cdot \rho_i}$$

Example Calculation

Tank: 241-AZ-101
Waste Phase: Sludge (Liquid & Solid) => NA (Sludge)

$$Mass = 30kL \cdot 1.59 \frac{g}{mL} \cdot \frac{1000L}{kL} \cdot \frac{1000mL}{L} = 4.77 \cdot 10^{7} g$$

(3) Adjusted analyte concentrations per total sludge waste

$$AZ101_j := \frac{Inventory_{0,j} + Inventory_{1,j}}{m_{phase_0} + m_{phase_1}}$$

$$B101_j := \frac{Inventory_{2,j} + Inventory_{3,j} + Inventory_{4,j}}{m_{phase_2} + m_{phase_3} + m_{phase_4}}$$

$$B103_j := Analytes_{5,j}$$

$$T102_j := \frac{Inventory_{7,j} + Inventory_{8,j}}{m_{phase_7} + m_{phase_8}}$$

$$T101_j := Analytes_{6,j}$$

$$T103_j := \frac{Inventory_{9,j} + Inventory_{10,j} + Inventory_{11,j}}{m_{phase_9} + m_{phase_{10}} + m_{phase_{11}}}$$

$$B201_j := Analytes_{12,j}$$

$$B202_j := Analytes_{13,j}$$

$$B203_j := Analytes_{14,j}$$

$$B204_j := Analytes_{15,j}$$

$$T201_j := Analytes_{21,j}$$

$$T202_j := Analytes_{22,j}$$

$$T203_j := Analytes_{23,j}$$

$$T204_j := Analytes_{24,j}$$

$$T104_j := Analytes_{16,j}$$

$$T110_j := \frac{Inventory_{17,j} + Inventory_{18,j}}{m_{phase_{17}} + m_{phase_{18}}}$$

$$T111_j := \frac{Inventory_{19,j} + Inventory_{20,j}}{m_{phase_{19}} + m_{phase_{20}}}$$

<u>Example Calculation</u>

Tank: 241-AZ-101

$$AZ101 = \frac{5.25 \cdot 10^4 \mu Ci\ +\ 2.92 \cdot 10^5 \mu Ci}{4.77 \cdot 10^7 g\ +\ 2.66 \cdot 10^8 g} = 1.10 \cdot 10^{-3} \frac{\mu Ci}{g(sludge)}$$

(4) Adjusted analyte concentrations for all tanks containing potential TRU wastes

$$TRU := B201 + B202 + B203 + B204 + T104 + T110 + T111 + T201 + T202 + T203 + T204$$

<u>Example Calculation</u>
Analyte: ^{129}I

$$TRU = 5 \cdot 10^{-12} + 0 + 0 + 0 + 3 \cdot 10^{-7} + 1 \cdot 10^{-10} + 7 \cdot 10^{-11} + 5 \cdot 10^{-12} + 5 \cdot 10^{-12} + 0 + 0 + 0$$
$$= 3 \cdot 10^{-7} \frac{\mu Ci}{g\ (solids)}$$

Results

(1) Adjusted analyte concentrations for all tanks

$$\begin{pmatrix} \text{"129I"} \\ \text{"137Cs"} \\ \text{"137mBa"} \\ \text{"14C"} \\ \text{"151Sm"} \\ \text{"90Sr"} \\ \text{"90Y"} \\ \text{"99Tc"} \\ \text{"233U"} \\ \text{"234U"} \\ \text{"235U"} \\ \text{"236U"} \\ \text{"237Np"} \\ \text{"238Pu"} \\ \text{"238U"} \\ \text{"239Pu"} \\ \text{"240Pu"} \\ \text{"241Am"} \\ \text{"241Pu"} \\ \text{"242Pu"} \end{pmatrix}
\quad AZ101 = \begin{pmatrix} 1E-003 \\ 7E+002 \\ 7E+002 \\ 1E-003 \\ 4E+002 \\ 2E+004 \\ 2E+004 \\ 2E-001 \\ 5E-004 \\ 2E-003 \\ 10E-005 \\ 3E-004 \\ 4E-002 \\ 5E-001 \\ 2E-003 \\ 4E+000 \\ 1E+000 \\ 8E+001 \\ 2E+001 \\ 1E-004 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}
\quad B101 = \begin{pmatrix} 5E-007 \\ 1E+000 \\ 1E+000 \\ 1E-004 \\ 2E+002 \\ 1E+003 \\ 1E+003 \\ 7E-003 \\ 6E-007 \\ 1E-002 \\ 6E-004 \\ 2E-004 \\ 2E-005 \\ 2E-001 \\ 1E-002 \\ 2E+000 \\ 6E-001 \\ 9E+000 \\ 7E+000 \\ 9E-005 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$B103 = \begin{pmatrix} 5E-007 \\ 2E+000 \\ 2E+000 \\ 8E-005 \\ 8E-002 \\ 4E+001 \\ 4E+001 \\ 1E-003 \\ 7E-008 \\ 9E-002 \\ 4E-003 \\ 7E-004 \\ 6E-006 \\ 2E-006 \\ 9E-002 \\ 6E-004 \\ 4E-005 \\ 1E-004 \\ 3E-005 \\ 2E-010 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}
\quad T101 = \begin{pmatrix} 3E-007 \\ 6E-001 \\ 5E-001 \\ 10E-004 \\ 2E-002 \\ 5E-001 \\ 5E-001 \\ 2E-004 \\ 2E-008 \\ 10E-003 \\ 4E-004 \\ 3E-004 \\ 1E-006 \\ 2E-002 \\ 7E-003 \\ 9E-001 \\ 2E-001 \\ 9E-002 \\ 9E-001 \\ 8E-006 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}
\quad T102 = \begin{pmatrix} 1E-004 \\ 1E+001 \\ 1E+001 \\ 3E-002 \\ 2E-002 \\ 1E+002 \\ 1E+002 \\ 1E-002 \\ 1E-002 \\ 10E-003 \\ 4E-004 \\ 1E-004 \\ 3E-004 \\ 7E-004 \\ 10E-003 \\ 3E-002 \\ 7E-003 \\ 2E-001 \\ 4E-002 \\ 3E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$\begin{pmatrix} \text{"129I"} \\ \text{"137Cs"} \\ \text{"137mBa"} \\ \text{"14C"} \\ \text{"151Sm"} \\ \text{"90Sr"} \\ \text{"90Y"} \\ \text{"99Tc"} \\ \text{"233U"} \\ \text{"234U"} \\ \text{"235U"} \\ \text{"236U"} \\ \text{"237Np"} \\ \text{"238Pu"} \\ \text{"238U"} \\ \text{"239Pu"} \\ \text{"240Pu"} \\ \text{"241Am"} \\ \text{"241Pu"} \\ \text{"242Pu"} \end{pmatrix} \quad T103 = \begin{pmatrix} 8E\text{-}005 \\ 1E{+}000 \\ 1E{+}000 \\ 6E\text{-}004 \\ 2E\text{-}002 \\ 4E{+}000 \\ 4E{+}000 \\ 8E\text{-}004 \\ 7E\text{-}003 \\ 5E\text{-}003 \\ 2E\text{-}004 \\ 8E\text{-}005 \\ 1E\text{-}006 \\ 6E\text{-}004 \\ 5E\text{-}003 \\ 2E\text{-}002 \\ 6E\text{-}003 \\ 3E\text{-}003 \\ 3E\text{-}002 \\ 3E\text{-}007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad B201 = \begin{pmatrix} 5E\text{-}012 \\ 1E\text{-}001 \\ 1E\text{-}001 \\ 1E\text{-}007 \\ 4E\text{-}003 \\ 2E{+}000 \\ 2E{+}000 \\ 1E\text{-}008 \\ 4E\text{-}011 \\ 5E\text{-}005 \\ 2E\text{-}006 \\ 5E\text{-}007 \\ 1E\text{-}007 \\ 6E\text{-}003 \\ 5E\text{-}005 \\ 8E\text{-}001 \\ 4E\text{-}002 \\ 3E\text{-}002 \\ 8E\text{-}003 \\ 3E\text{-}006 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$B202 = \begin{pmatrix} 0E{+}000 \\ 7E\text{-}002 \\ 7E\text{-}002 \\ 2E\text{-}007 \\ 6E\text{-}003 \\ 3E{+}000 \\ 3E{+}000 \\ 5E\text{-}003 \\ 1E\text{-}010 \\ 1E\text{-}004 \\ 5E\text{-}006 \\ 2E\text{-}006 \\ 2E\text{-}007 \\ 2E\text{-}003 \\ 1E\text{-}004 \\ 1E\text{-}001 \\ 2E\text{-}002 \\ 7E\text{-}002 \\ 7E\text{-}002 \\ 4E\text{-}006 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad B203 = \begin{pmatrix} 0E{+}000 \\ 6E\text{-}003 \\ 6E\text{-}003 \\ 2E\text{-}007 \\ 6E\text{-}003 \\ 6E\text{-}002 \\ 6E\text{-}002 \\ 2E\text{-}008 \\ 3E\text{-}012 \\ 3E\text{-}006 \\ 1E\text{-}007 \\ 4E\text{-}008 \\ 8E\text{-}007 \\ 2E\text{-}003 \\ 3E\text{-}006 \\ 2E\text{-}001 \\ 3E\text{-}002 \\ 3E\text{-}002 \\ 5E\text{-}002 \\ 5E\text{-}007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad B204 = \begin{pmatrix} 0E{+}000 \\ 2E\text{-}002 \\ 2E\text{-}002 \\ 2E\text{-}007 \\ 5E\text{-}003 \\ 2E\text{-}003 \\ 2E\text{-}003 \\ 2E\text{-}008 \\ 2E\text{-}015 \\ 2E\text{-}009 \\ 9E\text{-}011 \\ 3E\text{-}011 \\ 2E\text{-}007 \\ 2E\text{-}003 \\ 2E\text{-}009 \\ 2E\text{-}001 \\ 3E\text{-}002 \\ 4E\text{-}002 \\ 4E\text{-}002 \\ 4E\text{-}007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$\begin{pmatrix} \text{"129I"} \\ \text{"137Cs"} \\ \text{"137mBa"} \\ \text{"14C"} \\ \text{"151Sm"} \\ \text{"90Sr"} \\ \text{"90Y"} \\ \text{"99Tc"} \\ \text{"233U"} \\ \text{"234U"} \\ \text{"235U"} \\ \text{"236U"} \\ \text{"237Np"} \\ \text{"238Pu"} \\ \text{"238U"} \\ \text{"239Pu"} \\ \text{"240Pu"} \\ \text{"241Am"} \\ \text{"241Pu"} \\ \text{"242Pu"} \end{pmatrix} \quad T104 = \begin{pmatrix} 3E-007 \\ 1E-001 \\ 1E-001 \\ 4E-005 \\ 6E-002 \\ 2E+000 \\ 2E+000 \\ 6E-004 \\ 3E-010 \\ 4E-004 \\ 1E-005 \\ 4E-006 \\ 1E-006 \\ 2E-003 \\ 3E-004 \\ 1E-001 \\ 2E-002 \\ 2E-002 \\ 4E-002 \\ 7E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad T110 = \begin{pmatrix} 1E-010 \\ 1E-002 \\ 1E-002 \\ 1E-006 \\ 1E-002 \\ 2E-002 \\ 2E-002 \\ 7E-007 \\ 7E-012 \\ 7E-006 \\ 3E-007 \\ 7E-008 \\ 3E-005 \\ 4E-004 \\ 7E-006 \\ 6E-002 \\ 6E-003 \\ 5E-003 \\ 8E-003 \\ 8E-008 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$T111 = \begin{pmatrix} 7E-011 \\ 9E-002 \\ 9E-002 \\ 7E-007 \\ 9E-003 \\ 4E+000 \\ 4E+000 \\ 8E-003 \\ 1E-009 \\ 1E-003 \\ 5E-005 \\ 1E-005 \\ 3E-007 \\ 6E-004 \\ 1E-003 \\ 1E-001 \\ 1E-002 \\ 5E-002 \\ 2E-002 \\ 2E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad T201 = \begin{pmatrix} 5E-012 \\ 2E-002 \\ 2E-002 \\ 1E-007 \\ 4E-003 \\ 6E-002 \\ 6E-002 \\ 1E-008 \\ 2E-015 \\ 2E-009 \\ 10E-011 \\ 2E-011 \\ 1E-007 \\ 2E-003 \\ 2E-009 \\ 7E-001 \\ 5E-002 \\ 4E-002 \\ 3E-002 \\ 2E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad T202 = \begin{pmatrix} 0E+000 \\ 6E-003 \\ 6E-003 \\ 2E-007 \\ 6E-003 \\ 2E-003 \\ 2E-003 \\ 2E-008 \\ 4E-011 \\ 3E-005 \\ 2E-006 \\ 5E-007 \\ 2E-007 \\ 1E-003 \\ 4E-005 \\ 2E-001 \\ 2E-002 \\ 3E-002 \\ 3E-002 \\ 3E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

$$\begin{pmatrix} \text{"129I"} \\ \text{"137Cs"} \\ \text{"137mBa"} \\ \text{"14C"} \\ \text{"151Sm"} \\ \text{"90Sr"} \\ \text{"90Y"} \\ \text{"99Tc"} \\ \text{"233U"} \\ \text{"234U"} \\ \text{"235U"} \\ \text{"236U"} \\ \text{"237Np"} \\ \text{"238Pu"} \\ \text{"238U"} \\ \text{"239Pu"} \\ \text{"240Pu"} \\ \text{"241Am"} \\ \text{"241Pu"} \\ \text{"242Pu"} \end{pmatrix} \quad T203 = \begin{pmatrix} 0E+000 \\ 6E-003 \\ 6E-003 \\ 2E-007 \\ 6E-003 \\ 2E-003 \\ 2E-003 \\ 2E-008 \\ 1E-012 \\ 1E-006 \\ 5E-008 \\ 1E-008 \\ 7E-007 \\ 2E-003 \\ 1E-006 \\ 2E-001 \\ 3E-002 \\ 4E-002 \\ 4E-002 \\ 5E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm} \quad T204 = \begin{pmatrix} 0E+000 \\ 6E-003 \\ 6E-003 \\ 2E-007 \\ 6E-003 \\ 4E-003 \\ 4E-003 \\ 2E-008 \\ 4E-013 \\ 4E-007 \\ 2E-008 \\ 5E-009 \\ 6E-007 \\ 2E-003 \\ 4E-007 \\ 2E-001 \\ 2E-002 \\ 2E-002 \\ 4E-002 \\ 4E-007 \end{pmatrix} \cdot \frac{\mu \cdot Ci}{gm}$$

CH2M HILL DOCUMENT RELEASE FORM

(1) Document Number:	RPP-16764	(2) New Revision Number: 1	☐ New ☐ Page Change ☑ Full Revision ☐ Cancel
(3) Impacted Documents:	none	(4) File Index Number:	
		(5) Effective Date:	December 16, 2004
(6) Document Title:	Origin of Waste in Single-Shell Tank 241-T-105		
(7) Change/Release Description:	see Record of Revision form		
(8) Change Justification:	General revision of document to discuss history of waste types transferred into this tank. Revised tank waste characterization discussion to reflect tank waste information network system information as of October 2004.		

(9) Approvals:

(a) Author (Print/Sign): Michael E. Johnson Michael E Johnson	Date: 12/15/2004
(b) Responsible Manager (Print/Sign): Stewart M. Mackay SMacKay	Date: 12/15/2004
(c) Reviewer (Optional, Print/Sign):	Date:
(d) Reviewer (Optional, Print/Sign):	Date:

(10) Distribution:

(a) Name	(b) MSIN	(a) Name	(b) MSIN
K. D. Boomer	H6-19	B. A. Higley	R2-12
M. J. Jennings	H6-03	J. G. Kristofzski	H6-03
S. M. Mackay	R2-58	D. E. Place	R2-12
A. Tedeschi	H6-19	W. Bryan	H6-19

(11) No. of Pages: ~~89~~ 87 VE 12-16-04

Release Stamp

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

(12) HDCS? ☑ Yes ☐ No

(13) Release Type: ☑ Public Release ☐ Internal Release

(14) Release Approval (Print/Sign): J. D. Aardal / Janis Aardal

Date: 12-16-2004

ORIGIN OF WASTE IN SINGLE-SHELL TANK 241-T-105

M. E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 821312
Cost Center: 501546
B&R Code:
UC:
Charge Code:
Total Pages: ~~89~~ 87 N.F 11-16-04

Key Words: Hanford, single-shell tank, 241-T-105, Bismuth phosphate process, first decontamination cycle, second decontamination cycle, coating removal, REDOX coating removal, waste

Abstract: A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tank 241-T-105. This review was conducted to support decisions concerning disposition of the waste present in this tank.

J. Aardal 12-16-04
Release Approval Date

DEC 16 2004
DATE:
HANFORD RELEASE
STA: 15
ID: 65

Release Stamp

Approved For Public Release

Tank Farm Contractor (TFC) **RECORD OF REVISION**	(1) Document Number RPP-16764	Page 1

(2) Title

Origin of Waste in Single-Shell Tank 241-T-105

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Resp. Engr. (print/sign/date)	Authorized for Release (6) Resp. Mrg (print/sign/date)
RS1	Add - Executive Summary and Section 4: Discussion that the radionuclide inventory is based on analyses of five core samples and used 10-11-2004 best basis inventory. Add - Section 2: Expanded discussion on types of records reviewed and information available in each of these records. Add - Sections 2.2 & 3.1: Added discussion that plutonium precipitate separated from uranium and fission products was washed three times and the wash water combined with the uranium and fission product solution. Add - Section 2.2.1: Added discussion that a separate transfer line from diversion box 241-T-153 to tank 241-T-104 was installed in 1944 to allow transfer of 1C/CW waste to tank 241-T-105 and 2C waste to tank 241-T-105. Tank 241-T-104 was operated at a level to avoid overflow. Add - Section 2.2.7: Included discussion on operating history for tank 241-S-107 prior to receipt of REDOX coating removal waste, some of which was transferred to tank 241-T-105. Add - Section 2.2.8: Indicated that analyses of HLO waste and tank 241-T-105 supernatant were not located. Add - Section 2.2.9: Indicated that analyses of T Plant equipment decon wastes transferred to tank 241-T-105 were not located. Add - Section 2.2.10: Included discussion on operating history for tank 241-BX-104 prior to receipt of B Plant cesium ion exchange waste, some of which was transferred to tank 241-T-105. Add - Section 2.2.12: Included discussion on comparison of sample results and waste types transferred into tank 241-T-105	M.E.Johnson 12/11/04 Michael E. Johnson	SMackay 12/15/04. STEWART MACKAY

Tank Farm Contractor (TFC) RECORD OF REVISION (continued)		(1) Document Number RPP-16764	Page 2
Change Control Record			
(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Resp. Engr. (print/sign/date)	(6) Resp. Mrg. (print/sign/date)
	based on Tank Interpretive Report. Add - Section 3.1: Spent nuclear fuel reprocessing completed in the 221 BiPO4 process when plutonium was separated from the metal waste. Change - Table 6: Sr concentrations reported for samples from tanks T-108 (top), T-108 (bottom), C-112 and average for 1C/CW were incorrectly transcribed from the reference document. Error was corrected. Add - Section 3.1.1: Included discussion on off-gas scrubbers and silver chemical reactors that were installed in the 221 BiPO4 Plants.		

RPP-16764
Revision 1

ORIGIN OF WASTE IN SINGLE-SHELL TANK 241-T-105

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
October 2004

CH2MHILL
Hanford Group, Inc.
Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

This page intentionally left blank.

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tank 241-T-105. This review was conducted to support decisions concerning disposition of the waste present in this tank.

Tank 241-T-105 presently contains approximately 98,000 gallons of sludge. Based on the waste transfer history, the sludge stored in tank 241-T-105 is comprised of first decontamination cycle waste (1C), second decontamination cycle (2C) waste, and coating removal waste (CW) from operation of the 221-T Bismuth Phosphate Plant, coating removal waste from operation of the 202-S Reduction-Oxidation (REDOX) Plant, and equipment decontamination waste from the 221-T Plant.

A total of five core samples of the sludge contained in tank 241-T-105 were obtained in March 1993, June 1993 and June 1997 and analyzed to determine radiochemical and chemical concentrations. Based on analyses of these core samples and waste templates, the concentration of transuranic elements in the tank 241-T-105 sludge is approximately 427.4 ηCi/g. The concentrations of cesium-137 and strontium-90 in the sludge contained in tank 241-T-105 are approximately 10.4 μCi/g and 58.7 μCi/g, respectively, decay corrected to January 1, 2004.

CONTENTS

1.0 INTRODUCTION 7

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-T-105 7
- 2.1 Description of Tank 241-T-105 7
- 2.2 Waste Transfers for Tank 241-T-105 9
  - 2.2.1 221-T Plant 2C Waste (July 1946 – April 1948) 9
  - 2.2.2 221-T Plant 1C/CW Waste (May 1948 – April 1951) 10
  - 2.2.3 221-T Plant 1C/CW Waste (August 1951 – January 1954) 11
  - 2.2.4 Trench Disposal of 1C/CW Supernatant (January 1954) 11
  - 2.2.5 221-T Plant 1C/CW Waste (March 1954 – December 1954) 12
  - 2.2.6 221-T Plant Coating Removal Waste (January 1955 to March 1956) 13
  - 2.2.7 Reduction-Oxidation Plant (REDOX) Plant Coating Removal Waste (June 1965) 13
  - 2.2.8 Hanford Laboratory Waste (March 1967 through December 1967) 15
  - 2.2.9 T-Plant Equipment Decontamination Waste (January 1968 to June 1969) 16
  - 2.2.10 B-Plant Cesium Ion Exchange Waste (October 1972 to June 1974) 17
  - 2.2.11 Salt-Well Pumping (February 1976 to April 1978) 19
  - 2.2.12 Comparison with Other Reports 20

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 21
- 3.1 221-B and 221-T Bismuth Phosphate Process Plant 21
  - 3.1.1 221-T and 221-B Plant Cell Drainage Waste 28
  - 3.1.2 221-T Shutdown 28
  - 3.1.3 221-T Equipment Decontamination Facility 29
- 3.2 221-B Plant Fission Products Processing 33
  - 3.2.1 Strontium and Rare Earths Processing 33
  - 3.2.2 Cesium and Strontium Processing 34
- 3.3 REDOX Continuous Solvent Extraction Processes 35

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-T-105 37

5.0 SUMMARY 38

6.0 REFERENCES 40

APPENDIX

A. VOLUME OF WASTE IN TANK 241-T-105 JANUARY 1945 THROUGH MAY 1977 ..... A-1

FIGURES

Figure 1. Tank 241-T-105 Plan View. 8

Figure 2. Bismuth Phosphate Process Diagram. 24

TABLES

Table 1. Composition of Tank 241-T-105 1C/CW Supernatant Discharged to Trench. 12
Table 2. Composition of Tank 241-T-105 REDOX CW Supernatant. 15
Table 3. Composition of Tank 241-T-105 Supernatant – B-Plant IX Waste 19
Table 4. Estimated Composition of Bismuth Phosphate Plant Wastes 25
Table 5. Analyses of Bismuth Phosphate Process Supernatants Stored. 26
Table 6. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant. 27
Table 7. T-Plant Equipment Decontamination Waste Discharged to Cribs. (3 sheets) 30
Table 8. Analysis of REDOX Coating Removal Waste. 36
Table 9. Transuranic Elements and Fission Products in Tank 241-T-105. 37
Table 10. Waste Transfer History for Tank 241-T-105. (2 sheets) 38

LIST OF TERMS

1C	first cycle of the bismuth phosphate plutonium decontamination process
2C	second cycle of the bismuth phosphate plutonium decontamination process
5-6	low activity cell drainage waste
CAW	Current Acid Waste
cc	cubic centimeters
Ci	curies
CW	Coating waste
DOE	U.S. Department of Energy
ft^2	square feet
g/gal	grams per gallon
g/L	grams per liter
g/mL	grams per milliliter
kg	kilograms
HLO	Hanford Laboratories waste
IX	Ion Exchange
<u>M</u>	molarity or moles per liter
MW	Metal waste
PAS	PUREX Acidified Sludge
PTA	phosphotungstic acid
PUREX	Plutonium Uranium Extraction Plant
REDOX	Reduction-Oxidation Plant
ηCi/g	nanocuries per gram
µCi/cc	micro-curies per cubic centimeters
µCi/g	micro-curies per gram
µCi/gal	micro-curies per gallon
µCi/L	micro-curies per liter
µCi/mL	micro-curies per milliliter
µg/cc	micrograms per cubic centimeters
µg/g	micrograms per gram
µg/L	micrograms per liter

1.0 INTRODUCTION

The origin of the waste in tank 241-T-105 has been reviewed to provide information for determining the disposition of this waste. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tank 241-T-105. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to single-shell tank 241-T-105. Section 4.0 provides a discussion on the radionuclide analyses of the waste in single-shell tank 241-T-105. Section 5.0 summarizes the waste types that were transferred into single-shell tank 241-T-105.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-T-105

This section provides a brief description of single-shell tank 241-T-105 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the waste presently stored in single-shell tank 241-T-105, publicly available reports for the Hanford Site were reviewed. Documents reviewed included the Hanford site contractors' monthly reports (1945 through 1975), Army Corp of Engineers monthly reports (December 1944 through December 1946), U. S. Atomic Energy Commission monthly reports (1947 through 1954), waste disposal reports (1948 through 1975), tank farm waste status summary reports, and miscellaneous letters and technical reports.

The Hanford site contractors' monthly reports for January 1945 through July 1951 list the volume of waste stored in the single-shell tanks, with the exception of the B-200 and T-200 series single-shell tanks. No records were located that provided the volume of wastes stored in the single-shell tanks from August 1951 through February 1952. Beginning in March 1952, waste transfers and the volume of waste stored in each single-shell tank were reported for each tank in a waste status summary report.

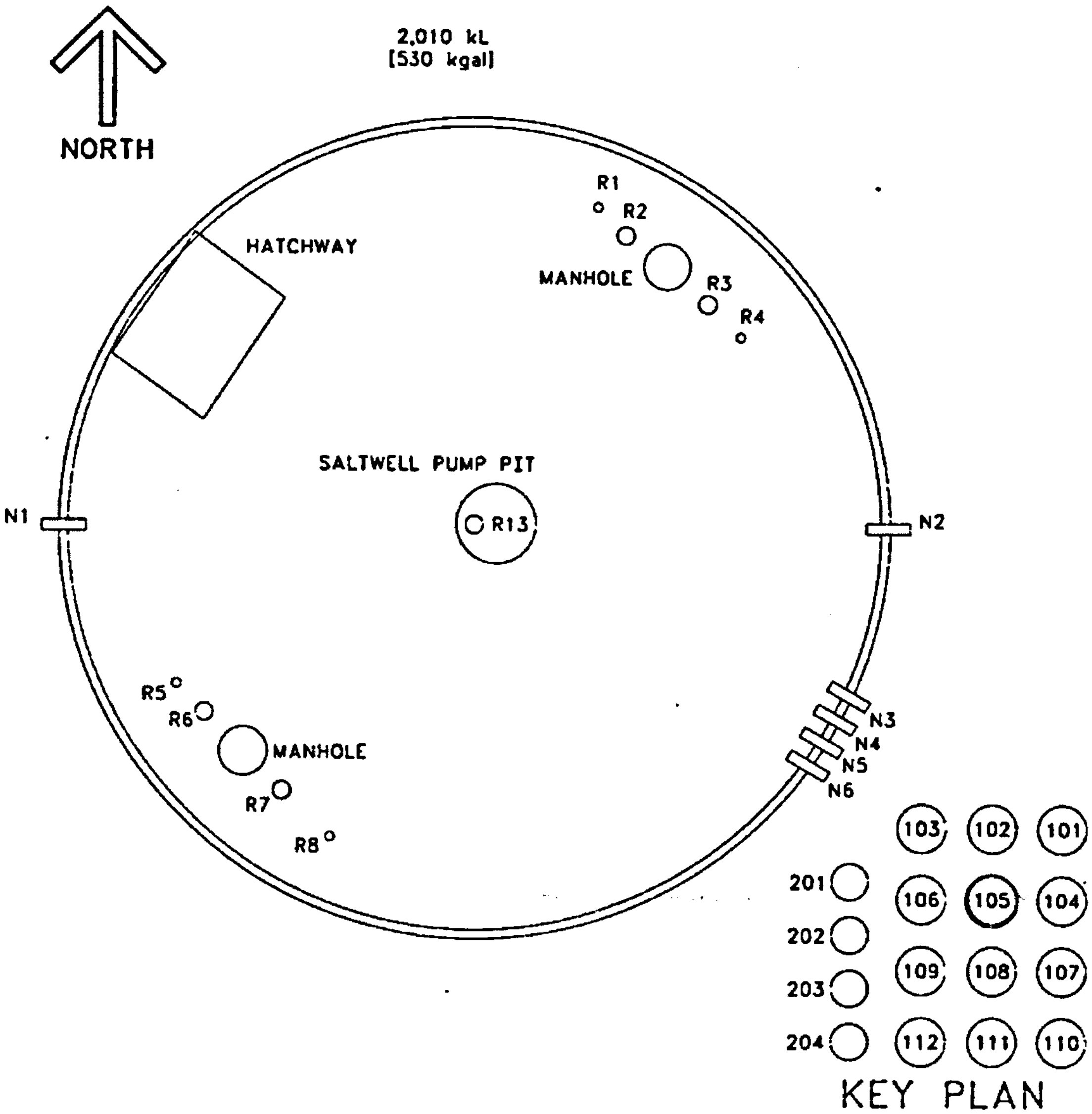
With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/ or the DOE Information Bridge at http://www.osti.gov/bridge/. The waste status summary reports are available only as photocopies from Hanford Site Records Information Management Services organization.

2.1 DESCRIPTION OF TANK 241-T-105

Single-shell tank 241-T-105 was originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, Chapter IX) and is one of the twelve, 100-series tanks in 241-T Tank Farm. Figure 1 provides a plan view of tank 241-T-105. The 100-series tanks are seventy-five-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. The steel liner extends to a height of nineteen-foot. Each 100-series tank has a design capacity of 530,000 gallons at a liquid depth of 16 feet, 8 inches. The 241-T Tank Farm also includes four 200-series tanks that are of similar construction as the 100-series tanks, but are only twenty-foot diameter and each have a capacity of 55,000 gallons.

Single-shell tank 241-T-105 is equipped with six, 3-inch diameter inlet / outlet nozzles, as depicted in Figure 1. Tank 241-T-105 was the second tank in the cascade that included tanks 241-T-104 and 241-T-106. Each tank in the cascade was located at an elevation of one foot lower than the preceding tank so that waste would gravity flow through the overflow pipeline from the filled tank to the next tank in the cascade. Tank 241-T-104 was connected via an underground overflow pipeline to nozzle N2 on tank 241-T-105. Nozzle N1 on tank 241-T-105 (see Figure 1) was connected to tank 241-T-106 via an underground overflow pipeline. Tank 241-T-105 was also connected in July 1946 via nozzle N6 to an underground pipeline (line number V-699) to diversion box 241-T-153 (HAN-45762, pages 15 and 32). The remaining three nozzles (N3, N4, and N5) on tank 241-T-105 were blanked off close to the tank when this tank was constructed in 1944 (HW-10475-C, pages 907 and 908).

Figure 1. Tank 241-T-105 Plan View.



2.2 WASTE TRANSFERS FOR TANK 241-T-105

Waste transfers into tank 241-T-105 and the operation of the tanks 241-T-104, 241-T-105, and 241-T-106 as a cascade are discussed in chronological order. A chronological listing is provided in Appendix A of waste transfers into and waste removal from tank 241-T-105 from 1945 through 1977. Section 3.0 describes the operation of the processing facilities that generated the waste types transferred into tank 241-T-105.

2.2.1 221-T Plant 2C Waste (July 1946 – April 1948)

Tanks 241-T-104, 241-T-105, and 241-T-106 were originally designated as a spare cascade of tanks that were intended to receive second decontamination cycle (2C) waste from operations at the 221-T Bismuth Phosphate Plant (see Section 3.0). However, the cascade of tanks that was receiving first decontamination cycle (1C) and coating removal waste (CW) from the 221-T Plant became filled in 1946, necessitating the use of tank 241-T-104 to store the 1C/CW waste. Piping modifications were conducted in July 1946 to allow tanks 241-T-104 and 241-T-105 to be filled independently. A separate transfer pipeline was established from diversion box 241-T-153 to tank 241-T-105 (HAN-45762, pages 15 and 32). A transfer line from diversion box 241-T-153 to tank 241-T-104 was installed when the 241-T tank farm was originally constructed in 1944. Tank 241-T-105 was still connected via the underground overflow pipeline to tank 241-T-106. Tank 241-T-104 was then used to receive 1C/CW waste from the 221-T Plant, but was maintained at an operating level that prevent waste cascading to tank 241-T-105 (see RPP-16129).

The cascade of tanks 241-T-110, 241-T-111, and 241-T-112 originally receiving 2C waste from the 221-T Plant also became filled in July 1946 (RPP-13873, page 3). Beginning on July 22, 1946, 2C waste from the 221-T Plant was diverted to tank 241-T-105 (HAN-45800-DEL, page 64 and HW-7-4542-DEL, page 21). Tanks 241-T-105 became filled with 2C waste in June 1947 and began to cascade waste into tank 241-T-106. Tanks 241-T-105 and 241-T-106 continued to receive 2C waste from the 221-T Plant until March 1948, when these two tanks were reported as being filled (HW-9595-DEL, page 32).

Plans were initiated in October 1946 to dispose of the 2C supernatant contained in tanks 241-T-105, 241-T-106, 241-T-110, 241-T-111, and 241-T-112 to an underground crib (HW-7-5362-DEL, page 27). A new underground crib (designated as 241-T-3) was constructed in 1947. Tank 241-T-110 would be used to settle solids that formed in the 2C waste, with the supernatant cascading by gravity flow into tank 241-T-111 and then into tank 241-T-112. The clarified 2C supernatant would be jetted from tank 241-T-112 to the underground crib. Crib disposal of the clarified 2C supernatant was authorized on an experimental basis (HW-10321). The 2C waste contained in tank 241-T-111 was jetted to this underground crib in September 1947 (HW-7795-DEL, page 26).

Prior to September 1945, the 2C waste was neutralized to a pH of approximately 10 in 221-T Plant before transfer to the single-shell tanks (HW-3-3220, page 13). Beginning in

September 1945, the pH of the 2C waste was adjusted to approximately pH 7 in 221-T Plant before transfer to the single-shell tanks. This adjustment was done to cause the precipitation of bismuth and plutonium in the 2C waste so that the supernatant would contain a lower concentration of plutonium (HW-7-2548-DEL, page 22 and HW-7-2706-DEL, page 21). As a result, tank 241-T-105 contained settled 2C solids (i.e., bismuth and plutonium precipitate) and 2C supernatant. The level of sludge in tank 241-T-105 was reported 5 feet, 6 inches, as of April 29, 1948 (HAN-45807-DEL, page 55), which corresponds to a sludge volume of 161,030 gallons.

Approximately 360,000 gallons of 2C supernatant were jetted from tank 241-T-105 to crib number 241-T-3 in April 1948 (HW-9922-DEL, page 31). After removal of the 2C supernatant, tank 241-T-105 was used to store 1C/CW waste as discussed in Section 2.2.2.

In July and August 1948, the 2C supernatant present in tank 241-T-106 was jetted to the 241-T-3 crib (HW-10714-DEL, page 32 and HW-10993-DEL, page 35). Crib disposal of approximately 450,000 gallons of the 2C waste in tank 241-T-112 was initiated on August 4, 1948 (HW-10993-DEL, page 35) and halted in September 1948 (HW-11226-DEL, page 32). While the 2C supernatant was being removed from tanks 241-T-105, 241-T-106, and 241-T-112, 2C waste from the 221-T Plant was collected in tank 241-T-110, which cascaded to tanks 241-T-111 and 241-T-112. The 2C sludge settled in tanks 241-T-110 and 241-T-111 with the supernatant cascading by gravity flow into tank 241-T-111 and then into tank 241-T-112. The clarified 2C supernatant was periodically transferred from tank 241-T-112 to the crib (RPP-13873, page 3).

2.2.2 221-T Plant 1C/CW Waste (May 1948 – April 1951)

After removing the 2C supernatant, 1C/CW waste from the 221-T Plant was jetted via diversion box 241-T-153 to tank 241-T-105 beginning in May 1948 (HW-10166-DEL, page 33 and HAN-45807-DEL, page 55). The 1C/CW waste accumulated atop the 2C sludge present in tank 241-T-105. Tank 241-T-105 was reported as being filled in August 1948, and the 1C/CW waste began overflowing to tank 241-T-106. Tanks 241-T-105 and 241-T-106 were reported as being filled in January 1949 (HW-12391-DEL, page 38). The 1C/CW waste generated at the 221-T Plant was then transferred to the cascade of single-shell tanks 241-TX-109, 241-TX-110, 241-TX-111, and 241-TX-112.

Prior to October 1945, the 1C/CW waste was neutralized to a pH of approximately 10 in 221-T Plant before transfer to the single-shell tanks (HW-3-3220, page 13). Beginning in October 1945, the pH of the 1C/CW waste was adjusted to approximately pH 7 in 221-T Plant before transfer to the single-shell tanks. This adjustment was done to cause the precipitation of bismuth and plutonium in the 1C/CW waste so that the supernatant would contain a lower concentration of plutonium (HW-7-2706-DEL, page 21). As a result, the 1C/CW waste in tank 241-T-105 precipitated a sludge that contained bismuth and plutonium. The 1C/CW sludge settled atop of the 2C sludge already present in tank 241-T-105. A separate 1C/CW supernatant phase formed atop the 2C and 1C/CW sludges present in tank 241-T-105. The waste stored in tank 241-T-105 sat undisturbed until April 1951 when the supernatant was transferred to the tanks 241-TX-117 and 241-TX-118 for evaporation.

In April 1951, the 1C/CW supernatants stored in tanks 241-T-104, 241-T-105, and 241-T-106 were transferred to tanks 241-TX-117 and 241-TX-118 (HW-20991-DEL, page 53). Following removal of the 1C/CW supernatant, an estimated 470,000 gallons of sludges remained in these three tanks. The sludge volume in individual tanks was not reported. The 1C/CW supernatant present in tanks 241-T-107, 241-T-108, and 241-T-109 was also transferred to tanks 241-TX-117 and 241-TX-118 in May 1951 (HW-21260-DEL, pages 57 and 58), June 1951 (HW-21506-DEL, page 57), and July 1951 (HW-21802-DEL, page 42).

The 1C/CW supernatants in tanks 241-TX-117 and 241-TX-118 were processed in the 242-T Evaporator from April 28, 1951 (HW-20991-DEL page 54 and HAN-63671-DEL, page 40) through July 1951 (HW-21802-DEL, page 42). The concentrated 1C/CW supernatant waste (i.e., evaporator bottoms) was stored in tanks 241-TX-116 and 241-TX-117. The evaporator bottoms in tanks 241-TX-116 and 241-TX-117 were eventually processed again through the 242-T Evaporator to further concentrate these wastes for storage in tanks 241-TX-110 and 241-TX-111.

2.2.3 221-T Plant 1C/CW Waste (August 1951 – January 1954)

After evaporating the 1C/CW supernatant, the cascade of tanks 241-T-104, 241-T-105, and 241-T-106 again received 1C/CW waste from the 221-T Plant. No record could be found of the precise date that 1C/CW waste was diverted to the cascade of tanks 241-T-104, 241-T-105, and 241-T-106. However, tank 241-T-104 was reported as being filled with 1C/CW waste in August 1951. The 1C/CW waste then began to cascade from tank 241-T-104 into tank 241-T-105. Tank 241-T-105 was reported as being filled with 1C/CW waste on October 26, 1951. The 1C/CW waste then began to cascade from tank 241-T-105 into tank 241-T-106. Tank 241-T-106 was reported as being filled with 1C/CW waste on December 22, 1951 (HW-33591, page 12).

As previously discussed in Section 2.2.2, the 1C/CW waste formed a bismuth and plutonium precipitate in tank 241-T-105. The newly formed 1C/CW precipitate settled atop the 2C and 1C/CW sludge already present in tank 241-T-105. A measurement of the supernatant and sludge levels in tank 241-T-105 obtained in January 1953 indicated a supernatant volume of 381,000 gallons and a sludge volume of 149,000 gallons (HW-27842, page 10). The waste stored in tank 241-T-105 sat undisturbed until January 1954, allowing the sludge to fully settle and decay of radionuclides with short half-lives.

2.2.4 Trench Disposal of 1C/CW Supernatant (January 1954)

Plans were made to allow the 1C/CW waste to remain in the cascade of tanks 241-T-104, 241-T-105, and 241-T-106 for one year to allow for the decay of short-lived fission products, after which the supernatant was to be processed in the 242-T Evaporator (HW-27838, page 32). However, evaporation of the supernatant contained in these tanks was not conducted.

Instead, the 1C/CW supernatant contained in these tanks was discharged to trenches. On January 22, 1954, approximately 144,375 gallons of the 1C/CW supernatant contained in tank

241-T-105 were transferred into the east section of trench 241-T-1 (later renamed to trench 216-T-14). On January 29, 1954, approximately 242,000 gallons of the 1C/CW supernatant contained in tank 241-T-105 were transferred into a section of trench 241-T-2 (later renamed trench number 216-T-15). The composition of the 1C/CW supernatant discharged from tank 241-T-105 to these trenches is provided in Table 1 (HW-33591, page 12).

The 1C/CW supernatant contained in tanks 241-BX-110, 241-BX-111, 241-BX-112, 241-BY-106, 241-BY-110, 241-T-104, 241-T-105, 241-T-106, 241-TX-109, 241-TX-110, and 241-TX-111, and 1C/CW evaporator bottoms contained in tanks 241-B-107, 241-B-108, 241-B-109, 241-TY-101, and 241-TY-102 were also discharged to trenches from January 1954 through November 1954 (HW-33591, pages 11 and 12 and HW-38562, pages 10, 28 and 29). The disposal of 1C/CW supernatant and evaporator bottoms to these trenches was based on the concept of retaining fission products, plutonium, and uranium in the soil column. Trench disposal of the 1C/CW supernatant and evaporator bottoms was thought to be an economical method for providing additional capacity in the single-shell tanks for storage of wastes with higher radioactivity (HW-34281).

Table 1. Composition of Tank 241-T-105 1C/CW Supernatant Discharged to Trench.

Analyte	Concentration (µCi/mL)	
	Trench 216-T-14	Trench 216-T-15
Plutonium (Pu)	4.7E-05	5.0E-05
Uranium (U)	1.8E-05	1.7E-05
Cesium (Cs)	0.42	0.44
Strontium (Sr)	8.7E-03	2.2E-02
pH	10.0	9.8
Volume (gallons)	144,375	242,000

Following the trench disposal of the 1C/CW supernatant, tank 241-T-105 contained approximately 4,000 gallons of 1C/CW supernatant and 149,000 gallons of sludge (HW-30851, page 5). The sludge in tank 241-T-105 was comprised of 2C and 1C/CW sludge from the 221-T Plant.

2.2.5 221-T Plant 1C/CW Waste (March 1954 – December 1954)

On February 23, 1954, the cascade of tanks 241-T-104, 241-T-105, and 241-T-106 again received 1C/CW waste from the 221-T Plant (HW-31126, page 5). Tank 241-T-104 was reported as being filled with 1C/CW waste on March 23, 1954, and waste began to cascade into tank 241-T-105 (HW-31374, page 5 and HAN-62359-DEL, April 5, 1954, page 11). Tank 241-T-105 was reported as being filled with 1C/CW waste on June 17, 1954 (HW-32389, page 5). The 1C/CW waste then began to cascade from tank 241-T-105 into tank 241-T-106. Tank 241-T-106 was reported as being filled with 1C/CW waste in August 26, 1954 (HAN-62359-DEL, September 8, 1954, page 21). The cascade of tanks 241-T-104, 241-T-105, and 241-T-106 stopped receiving 1C/CW waste on August 26 1954, and the 1C/CW waste from the 221-T Plant was routed to the cascade of tanks 241-TX-109, 241-TX-110, and 241-TX-111 (HAN-62359-DEL, September 8, 1954, page 21).

In November and December 1954, approximately 342,000 gallons of 1C/CW supernatant stored in tank 241-T-105 was transferred to tank 241-TX-118 (HW-33904, page 5 and HW-34412, page 5). Following removal of the 1C/CW supernatant, an estimated 188,000 gallons of sludges remained in tank 241-T-105. The 1C/CW supernatants in tank 241-TX-118 were processed in the 242-T Evaporator in December 1954 (HW-34147-DEL, page Ed-5). The concentrated 1C/CW supernatant waste (i.e., evaporator bottoms) was stored in tank 241-TX-117.

2.2.6 221-T Plant Coating Removal Waste (January 1955 to March 1956)

Beginning on October 20, 1954, nickel ferrocyanide scavenging of the 1C waste was conducted in T-Plant to precipitate cesium-137 and strontium-90 (HW-33585-DEL, page Ed-8 and HW-33184). The precipitated 1C waste slurry was transferred separate from the coating removal waste to tank 241-TY-101 for settling of the precipitate and discharge of the scavenged (i.e., cesium and strontium depleted) supernatant to a trench (HW-33544, page 7 and HAN-62359-DEL, November 4, 1954, page 34). Tanks 241-TY-103 and 241-TY-104 were also used to receive the precipitated 1C waste slurry from the 221-T Plant (HW-36001, page 7, and HW-41812, page 7) until the 221-T Plant was shut down in September 1956.

The coating removal waste (CW) from the 221-T Plant was transferred to tank 241-T-105 beginning in January 1955 (HW-35022, page 5). Tank 241-T-105 continued to receive CW waste from the 221-T Plant until March 1956. The 221-T Bismuth Phosphate process was shut down in March 1956 and cleanout of the facility was conducted (see Section 3.1.2). Tank 241-T-105 did not receive any waste from the cleanout activities conducted at the 221-T Plant. No waste transfers were made into or waste removal from tank 241-T-105 from April 1956 through May 1965.

2.2.7 Reduction-Oxidation Plant (REDOX) Plant Coating Removal Waste (June 1965)

In June 1965, approximately 210,530 gallons of supernatant were transferred from tank 241-S-107 to tank 241-T-105. Approximately 188,530 gallons of supernatant was transferred through the overflow line from tank 241-T-105 to tank 241-T-106. The supernatant present in tank 241-S-107 was coating removal waste from the REDOX Plant (ISO-806, pages 5 and 7). Operation of the REDOX Plant is discussed in Section 3.3.

Tank 241-S-107 is similar in design as tank 241-T-105, but has a nominal operating capacity of 758,000 gallons. Tank 241-S-107 was operated for a period of time as a cascade along with tanks 241-S-108 and 241-S-109. The first waste received into tank 241-S-107 was high level waste from the 202-S REDOX Plant, which was transferred to the cascade of tanks 241-S-107, 241-S-108 and 241-S-109 from August 25, 1952 (HW-27839, page 23) through February 8, 1953 (HW-27775, page 12). The cascade then received 'centrifuge cake waste' from the REDOX Plant from February 9, 1953 through May 1954 (HW-32110, page 7).

The cascade of tanks 241-S-107 through 241-S-109 then received coating removal waste from the REDOX Plant from November 1954 (HW-33904, page 7) through April 1955, at which time the cascade was filled (HW-36553, page 7). Tank 241-S-107 contained approximately 758,000 gallons of high-level and coating waste from the REDOX Plant as of April 1955. Approximately 182,000 gallons of supernatant was transferred from tank 241-S-107 to tank 241-S-106 in October 1955 (HW-39850, page 7) so that the tank could again receive coating removal waste from the REDOX Plant. By January 17, 1956, tank 241-S-107 was filled with 757,000 gallons of high-level and coating waste from the REDOX Plant (HW-41038, page 7). No waste was added or removed from tank 241-S-107 until July 1957, when 202,000 gallons of supernatant were transferred to tank 241-U-107, leaving 541,000 gallons of REDOX Plant waste in tank 241-S-107 (HW-51858, page 7). Tank 241-S-107 again received REDOX Plant coating removal waste from August 1957 (HW-52414, page 7) through the first quarter of calendar year 1967 (ISO-806, page 7). The coating removal waste was transferred to other single-shell tanks in the 200 West Area.

A total of approximately 2.5 million gallons of REDOX Plant coating removal waste was transferred into tank 241-S-107 from November 1954 through May 1965, before transferring REDOX Plant coating removal waste to tank 241-T-105. An additional 0.7 million gallons of coating removal waste was transferred through tank 241-S-107 from June 1965 through the first quarter of calendar year 1967 (LA-UR-97-311). The original 758,000 gallons of REDOX Plant high-level waste received in tank 241-S-107 between August 1952 through May 1954 was diluted by a factor of about 3.3 by May 1965, due to the receipt of the approximately 2.5 million gallons of coating removal waste.

Tank 241-T-105 contained a mixture 2C and 1C/CW sludges from the 221-T Plant, 221-T Plant CW supernatant, and REDOX Plant CW supernatant. The supernatant in tank 241-T-105 was sampled and analyses reported in September 1965 in preparation for processing in the 242-T Evaporator (LET-092465). The September 1965 analysis of the tank 241-T-105 supernatant is presented in Table 2.

Table 2. Composition of Tank 241-T-105 REDOX CW Supernatant.

Analyte	Concentration	Units
Free hydroxide (OH)	0.779	M
Carbonate (CO_3)	26.2	g/L
Aluminate (AlO_2)	8.48	g/L
Fluoride (F)	0.076	g/L
Chloride (Cl)	1.39	g/L
Sodium (Na)	58	g/L
Nitrate (NO_3)	97.5	g/L
Cyanide (CN)	Not detected	
Cesium-137	7.1E-01	µCi/mL
Zironium-Niobium-95	3.17E-01	µCi/mL
Specific Gravity	1.126	
Supernatant Volume	505,000	Gallons
Sludge Volume	58,000	Gallons

The volume of sludge reported to be in tank 241-T-105 in first quarter of calendar year 1965 was approximately 62,000 gallons. This is significantly less than the 188,000 gallons of sludge reported present in tank 241-T-105 from January 1955 through December 1964 (see Appendix A). It is possible that the REDOX coating removal waste that was transferred into tank 241-T-105 in June 1965 could have dissolved some of the 2C and 1C/CW sludges. It is also probable that the 2C and 1C/CW sludge volume was reduced by settling and compaction of these sludges.

No waste transfers were made into or waste removal from tank 241-T-105 from June 1965 through December 1966.

In the January 1967, approximately 407,000 gallons of supernatant were transferred from tank 241-T-105 to tank 241-TX-118 for processing in the 242-T Evaporator (ISO-806, page 5). A blend of 241-T-105 and previously evaporated waste (i.e., evaporator bottoms) was processed in the 242-T Evaporator in January 1967 (HAN-96590-DEL, page AIII-5) through February 1967 (HAN-96805-DEL, page AIII-5). The volume of supernatant and sludge remaining in tank 241-T-105 was 66,000 gallons and 62,000 gallons, respectively.

2.2.8 Hanford Laboratory Waste (March 1967 through December 1967)

The Hanford Laboratories located in 300 Areas of the Hanford Site contained hot cells for conducting research and development activities. Waste from the Hanford Laboratories (designated as HLO waste) was transported in a tanker truck to the 200 West Area for disposal into cribs (BNWC-91, page 22, and ISO-98, pages 22 and 24). If the radionuclide content of the HLO waste exceeded the limits for disposal into a crib, then the HLO waste was transferred into a single-shell tank for storage.

In March 1967, 55,000 gallons of HLO waste was transferred from the transport tanker truck into tank 241-T-105 (ISO-806, page 5 and HAN-97066-DEL, page AIII-5). A spill of HLO waste was reported in the 241-T Tank Farm, contaminating approximately 600 ft^2 of the ground to a maximum dose rate of 100 mrad per hour. Most of the contaminated soil was removed and the rest covered with gravel (HAN-97066-DEL, page AIII-5). Tank 241-T-105 received an additional 70,000 gallons in April 1967, 185,000 gallons in May 1967, and 31,000 gallons of HLO waste in June 1967 (ISO-967, page 5, HAN-97300-DEL, page AIII-4, and HAN-97845-DEL, page AIII-3). An analysis of the HLO wastes transferred to tank 241-T-105 could not be located.

At the end of June 1967, tank 241-T-105 was filled, containing approximately 66,000 gallons of REDOX CW supernatant, 396,000 gallons of HLO supernatant and approximately 62,000 gallons of 2C and 1C/CW sludges. Beginning on July 28, 1967, the HLO waste that could not be disposed to crib number 216-T-35 was collected at the REDOX Plant and processed in the REDOX D-12 concentrator (HAN-98343-DEL, page AIII-3).

In the fourth quarter of calendar year 1967, approximately 396,000 gallons of supernatant (mixture of REDOX CW supernatant and HLO supernatant) was transferred from tank 241-T-105 to tank 241-TX-118 (ARH-326, page 6). An analysis of the supernatant transferred from tank 241-T-105 to tank 241-TX-118 could not be located. This supernatant was then processed in the 242-T Evaporator. Following this transfer, tank 241-T-105 contained approximately 66,000 gallons of supernatant and 62,000 gallons of 2C and 1C/CW sludges.

2.2.9 T-Plant Equipment Decontamination Waste (January 1968 to June 1969)

Equipment decontamination activities at the 221-T Plant are discussed in Section 3.1.3. The 221-T Plant equipment decontamination waste had previously been transferred into crib numbers 216-T-28 and 216-T-34 (BNWC-91, page 21, and ISO-98, page 23).

In the first quarter of 1968, tank 241-T-105 received approximately 141,000 gallons of waste from equipment decontamination activities conducted in the 221-T Plant (ARH-534, page 6). An additional 127,000 gallons of waste from 221-T Plant equipment decontamination activities were transferred into tank 241-T-105 in the second quarter of calendar year 1968 (ARH-721, page 6). An analysis of the 221-T Plant equipment decontamination waste transferred to tank 241-T-105 could not be located.

Approximately 9,000 gallons of supernatant present in tank 241-T-105 were then transferred to the REDOX Plant for processing in the D-12 Evaporator. In July 1968, approximately 279,000 gallons of supernatant were transferred from tank 241-T-105 to the REDOX Plant for processing in the D-12 Evaporator (ARH-871, page 6, and PR-REPORT-JUL68-DEL, page AIII-3).

No waste transfers were made into or waste removal from tank 241-T-105 from August 1968 through March 1969. An additional 57,000 gallons of waste from 221-T Plant equipment decontamination activities were transferred into tank 241-T-105 in the second quarter of calendar year 1969 (ARH-1200 B, page 7).

In September 1969, tank 241-T-105 was reported to contain approximately 101,000 gallons of supernatant and 62,000 gallons of sludge (ARH-1200 C, page 7). However, in December 1969, the volumes of supernatant and sludge were revised. The total volume of waste present in tank 241-T-105 was unchanged. The volumes of supernatant and sludge reported in tank 241-T-105 in December 1969 were 64,000 gallons and 99,000 gallons, respectively (ARH-1200 D, page 7). No documentation for the change in the sludge level in tank 241-T-105 could be located. The change in the report volume of sludge in tank 241-T-105 may have been due to correction of a previously inaccurate sludge depth measurement or precipitation of solids. Tank 241-T-105 had previously contained REDOX CW waste (see Section 2.2.7) and HLO waste (see Section 2.2.8), which could have precipitated solids. Similarly, the 221-T Plant equipment decontamination waste may have contained solids and/or precipitated solids in tank 241-T-105.

No waste transfers were made into or waste removal from tank 241-T-105 from July 1969 through September 1972.

2.2.10 B-Plant Cesium Ion Exchange Waste (October 1972 to June 1974)

In the fourth quarter of calendar year 1972, approximately 316,000 gallons of waste from operation of the cesium ion exchange (IX) process and low-level waste evaporator in B-Plant was collected in tank 241-BX-104 and transferred to tanks 241-T-105 (ARH-2456 D, page 6). Operation of the B-Plant for cesium and strontium recovery is discussed in Section 3.2.

Tank 241-T-105 again received B-Plant IX waste from tank 241-BX-104 in the first quarter of calendar year 1973 (ARH-2794 A, page 6). Approximately 63,000 gallons of supernatant were received into tank 241-T-105. Approximately 4,000 gallons of supernatant were transferred from tank 241-T-105 to tank 241-T-106. An additional 452,000 gallons of B-Plant IX and low-level waste evaporator supernatant were transferred from tank 241-T-107 to tank 241-T-105 in the second quarter of calendar year 1973 (ARH-2794 B, page 6 and RPP-16765, section 2.2.9). Approximately 451,000 gallons of supernatant were then transferred from tank 241-T-105 into tank 241-T-106 (ARH-2794 B, page 6).

Tank 241-BX-104 is similar in design and capacity as tank 241-T-105. Tank 241-BX-104 was previously used from January 1949 through January 1955 to store metal waste generated from operation of the 221-B Plant (SD-WM-TI-302, pages 66, 86-88 and WHC-MR-0132, table 104-BX). The metal waste was removed from tank 241-BX-104 using hydraulic sluicing jets and transfer pumps. The tank was visually inspected with a periscope optic unit to verify removal of metal waste prior to re-use of the tank. The tank was reported as containing no waste following sluicing. Due to the retrieval method and limitation of the periscope optical inspection method, it is likely that a small quantity of metal waste solids may have been left in tank 241-BX-104. Tank 241-BX-104 received TBP Plant waste in 1956, which was then discharged to a ditch in 1957 leaving approximately 54,000 gallons of supernatant in this tank. PUREX coating removal waste was transferred to tank 241-BX-104 in 1962 (from tank 241-C-102) and in 1964 (from tank 241-C-108). The PUREX coating removal waste and TBP Plant waste heel was transferred from tank 241-BX-104 to tank 241-BY-103 in 1967, leaving a heel of approximately 7,000 gallons of supernatant and 87,000 gallons of sludge.

Tank 241-BX-104 was then used from 1967 through 1970 to receive approximately 4.6 million gallons of cesium ion exchange and evaporator waste from B-Plant. These wastes were transferred to other single-shell tanks. From 1971 through third quarter 1972, tank 241-BX-104 received and transferred to B-Plant for cesium ion exchange processing approximately 5.3 million gallons of REDOX high-level wastes. In the third quarter of 1972, tank 241-BX-104 again was used to receive cesium ion exchange waste from B-Plant, which was then transferred to other single-shell tanks. Tank 241-BX-104 had received approximately 3.8 million gallons of cesium ion exchange waste from B-Plant through the second quarter of 1973. Therefore, any other wastes types previously stored in this tank were vastly diluted and transferred to other tanks by the time the B-Plant cesium ion exchange waste was transferred from tank 241-BX-104 to tank 241-T-105 (and 241-T-107).

Tank 241-T-105 contained approximately 439,000 gallons of supernatant and 100,000 gallons of sludge following these transfers. The supernatant was mostly cesium ion exchange waste from B-Plant while the sludge was a mixture of 2C and 1C/CW from the 221-T Bismuth Phosphate Plant along with CW from the REDOX Plant.

In preparation for processing in the 242-S Evaporator, the supernatant in tank 241-T-105 was sampled in 1974 and analyses reported on September 17, 1974 (MEM-010274). The analytical results for this sampling event are presented in Table 3. Approximately 425,000 gallons of supernatant in tank 241-T-105 were transferred to tank 241-S-110 in the second quarter of calendar year 1974 for processing in the 242-S Evaporator (ARH-CD-133 B, page 6). The volumes of supernatant and sludge remaining in tank 241-T-105 were 13,000 gallons and 100,000 gallons, respectively. No additional waste transfers involving tank 241-T-105 occurred until this tank was removed from service in January 1976.

Table 3. Composition of Tank 241-T-105 Supernatant – B-Plant IX Waste.

Analyte	1974 Supernatant Concentration (μCi/ml)	Units
Cesium-137	3.86E+05	μCi/gal
Cesium-134	5.53E+03	μCi/gal
Cobalt-60	5.56E+02	μCi/gal
Antimony-125	4.84E+04	μCi/gal
Ruthenium-106 / Rhodium-106	1.61E+06	μCi/gal
Strontium-89,90	Not reported	μCi/gal
Al	0.039	M
Na	3.96	M
NO_2	1.47	M
NO_3	0.606	M
Pu	< 4.43E-06	g/gal
Am-241	Not reported	μCi/gal
Differential Thermal Analysis	No exotherm	
SO_4	0.158	M
PO_4	0.00571	M
F	0.0408	M
OH	0.109	M
CO_3	0.844	M
pH	12.7	
Specific Gravity	1.213	
Visual Observation of sample	Dark amber, trace of solids	

2.2.11 Salt-Well Pumping (February 1976 to April 1978)

Tank 241-T-105 was removed from service in January 1976. Removal of liquid from tank 241-T-105 was conducted from February 1976 through April 1978 as part of the program to remove interstitial liquid (i.e., saltwell pumping) from the single-shell tanks (Letter 60410-78-092). A total of 28,196 gallons of liquid waste were reported as being pumped from tank 241-T-105 to tank 241-T-101 during this period.

In May 1987, photographs were obtained of the waste surface in tank 241-T-105 to estimate the amount of liquid and sludge remaining (HNF-SD-RE-TI-178, pages 207 to 213). The estimated volume of sludge present in tank 241-T-105 was 98,025 gallons. The estimated volume of drainable liquid in the sludge was 22,812 gallons. The estimated supernatant volume in tank 241-T-105 on May 1987 was 413 gallons. Tank 241-T-105 was administratively declared having been Interim Stabilized on May 29, 1987.

2.2.12 Comparison with Other Reports

Waste transfers into and waste removals from tank 241-T-105 are summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132) for 1945 through 1980, *Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 West Area* (HNF-SD-WM-ER-351), *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311) and the Tank Waste Information Network (http://twins.pnl.gov/). The information cited in Sections 2.2.1 through 2.2.11 is in agreement with these previous reports. These previous reports accurately state the volume of waste transferred into and removed from tank 241-T-105, as well as the volume of solids and total waste stored. However, there is some ambiguity over the source of the sludge present in tank 241-T-105.

The *Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 West Area* (HNF-SD-WM-ER-351) indicates that tank 241-T-105 contains only 2C and 1C/CW sludges from the 221-T Bismuth Phosphate Plant. However as documented in Section 2.2, tank 241-T-105 also received coating removal waste from the T-Plant, coating removal waste from the REDOX Plant, and T-Plant equipment decontamination waste. These wastes may also have formed precipitates that settled in tank 241-T-105.

The Tank Interpretive Report (TIR) (http://twins.pnl.gov/) states the core samples obtained from tank 241-T-105 are consistent with the 2C, 1C, and CWR waste type being present in this tank. However, other waste additions including REDOX cladding wastes and aluminum cladding wastes (CW) may also have been added to the upper portion of the sludge layer. The sludge at the bottom of the tank was second cycle bismuth phosphate waste (2C). Other dilute waste additions including laboratory wastes, B Plant ion exchange waste (IX), B Plant low-level waste (BL), and T Plant decontamination wastes were assumed to be negligible or removed from the tank during supernatant transfers and salt well pumping.

The *Tank Characterization Report for Single-Shell Tank 241-T-105* (HNF-SD-WM-ER-369, Rev. 2B, Appendix D) assumes REDOX high-level waste (R1) was transferred into tank 241-T-105 based on comparing the tank 241-T-105 sludge composition with the composition of REDOX high-level waste. The *Tank Characterization Report for Single-Shell Tank 241-T-105* assumes the relatively high concentrations of aluminum, chrome, strontium-90, and cesium-137 present in the top layer of tank 241-T-105 sludge is characteristic of REDOX high-level waste. However, the 2004 TIR states "...upon closer evaluation, no transfer records of R1 waste were found and other R1 fission products appeared to be unreasonably high. Therefore, the upper layer of waste was determined to consist of mostly CWR1 [REDOX coating removal waste], with a small portion of 1C and no R1 waste". The TIR is the more current evaluation of the waste type present in tank 241-T-105 compared to the 1998 *Tank Characterization Report for Single-Shell Tank 241-T-105*.

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, plutonium processing and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, plutonium processing and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997.*

It has been established in Section 2.0 that first decontamination cycle (1C) waste mixed with coating removal waste (CW) from the 221-T Bismuth Phosphate plant was transferred into tank 241-T-104. Tank 241-T-107 also received waste from the Tri-Butyl Phosphate (221-U) Plant, cesium ion exchange waste from B-Plant, and coating removal waste from the Plutonium Uranium Extraction (PUREX) Plant. The following sections provide a discussion of these waste types.

3.1 221-B and 221-T Bismuth Phosphate Process Plant

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from irradiated nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion. The Bismuth Phosphate process was operated in B-Plant from April 1945 (HW-7-1649-DEL, page 21) through June 1952 (HW-25227-DEL, pages Ed-5 and Ed-6), after which the inventory of radioactive materials was removed from the facility from July 1952 through March 1953 (HW-27774). The Bismuth Phosphate process was operated in T-Plant from December 1944 (HAN-45800-DEL, page 4) through March 1956, after which the inventory of radioactive materials was removed from the facility from March 1956 (HW-42219-DEL, page ED-5) through September 1956 (HW-45707-DEL, page D-5). T-Plant was placed in layaway status in October 1956 (HW-46432-DEL, page D-5).

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste sometimes referred to as coating waste (CW) was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

Reprocessing of the spent nuclear fuel commenced with the dissolution of the uranium fuel elements. The uranium fuel elements (see item [2] in Figure 2) were then dissolved in nitric acid (HW-10475-C, Chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution, and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented uranium precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed three times with water to separate the acidic supernatant from the plutonium precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW). Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). Of the predominate radionuclides remaining in the waste, the laboratory tests indicate the percentage of cesium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively.

After separating and washing the plutonium precipitate from the metal waste, reprocessing of spent nuclear fuel was completed in the 221 Plant Bismuth Phosphate process. Plutonium decontamination was conducted in the remainder of the 221 Plant Bismuth Phosphate process. The plutonium bearing cake was then dissolved in nitric acid and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, Chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products (e.g., cerium, niobium, ruthenium, and zirconium), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C waste) were transferred to the single-shell tanks. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids from the first decontamination cycle were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28).

During operation of B-Plant, the 1C waste was combined with the coating removal waste and transferred to the same single-shell tank. This same practice was conducted in T-Plant from December 1944 through October 19, 1954. Beginning on October 20, 1954, nickel ferrocyanide scavenging of the 1C waste was conducted in T-Plant to precipitate cesium-137 and strontium-90 (HW-33585-DEL, page Ed-8 and HW-33184). The precipitated 1C waste slurry was transferred separate from the coating removal waste to single-shell tanks for settling of the precipitate and discharge of the scavenged (i.e., cesium and strontium depleted) supernatant to a crib.

Table 5 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the 221-B/T bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C/CW, and 2C that was stored in single-shell tanks are provided in Tables 6 and 7. These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Figure 2. Bismuth Phosphate Process Diagram.

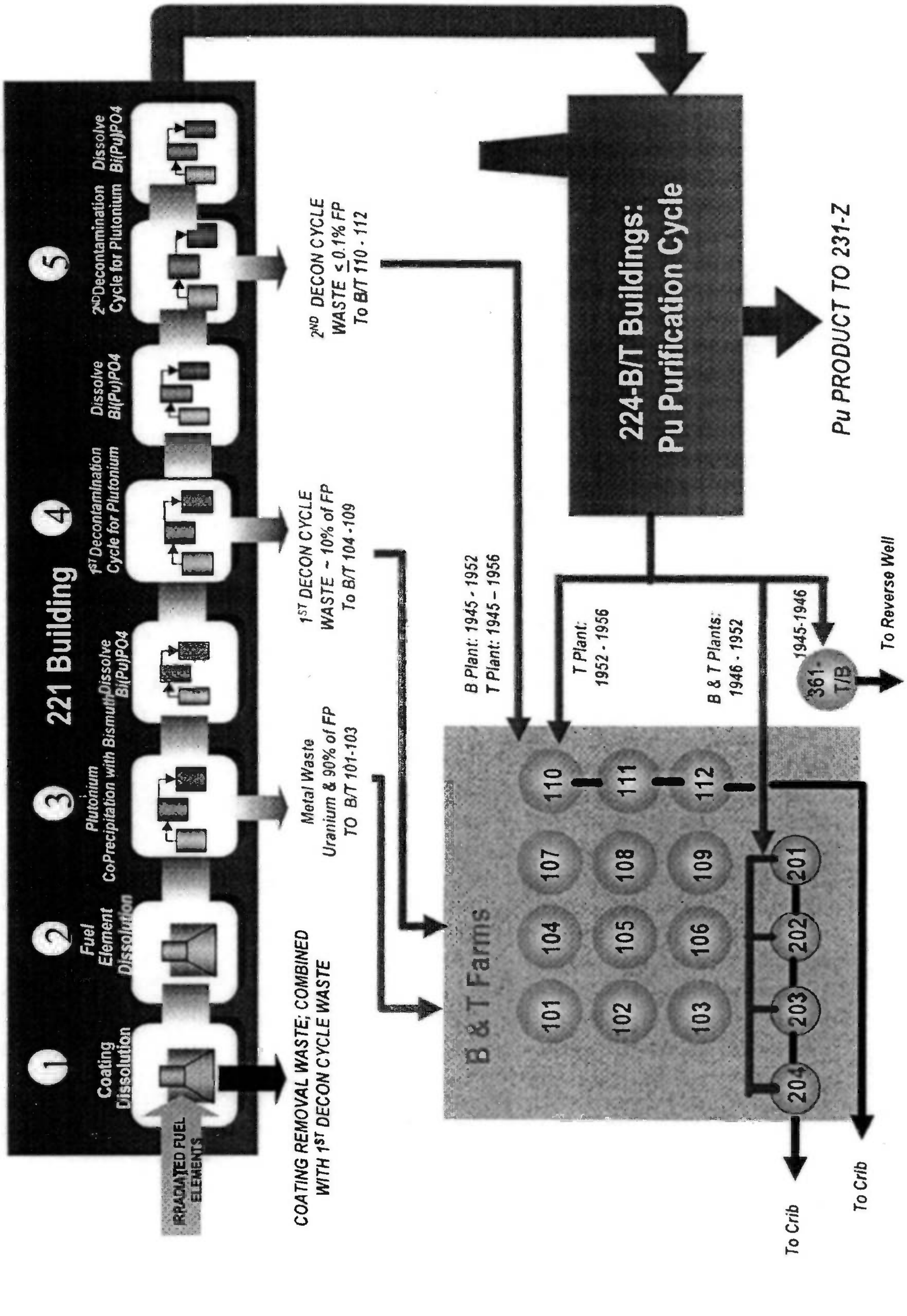


Table 4. Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet [1]

Analyte [2]	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04 [6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02 [6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

[1] See HW-23043

[2] Analyses are reported in grams per liter, except for gamma activity, which is counts/minute/mL.

[3] HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.

[4] Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).

[5] Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).

[6] Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

Table 5. Analyses of Bismuth Phosphate Process Supernatants Stored.

Waste Type (1,2)	Tank	pH	Pu µg/L	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200(5)	70(5)	12-12-1946
Metal Waste	T-101	10	35	110(5)	25(5)	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? (3)	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µg/L**	**Gross Beta Counts / minute/ cc**	**Gross Gamma Counts / minute/ cc**	**Date Sampled**
2C	T-110	Not reported (4)	15	4.9E+04	30	7-13-1945
2C	T-110	9.8(4)	19	6.9E+04	55	7-25-1945
2C	B-110	9.6(4)	8.5	7.0E+04	55	7-25-1945

Notes:

(1) See HW-10728 and HW-3-3220.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 1C and 2C wastes were neutralized to a pH of approximately 10. The waste collected in tanks 241-B-110, 241-B-111, 241-B-112, 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Decrease in gross beta and gross gamma concentrations shown for the T-101 waste samples are due to decay of fission products with short half-lives.

Table 6. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant.

Tank	Date Filled	Pu µg/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y − Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.012	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.012	Not reported	0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.006	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.0058**	**0.15**						

Notes:

[1] HW-36717, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, May 16, 1955, W. W. Schulz, General Electric Company, Richland, Washington.

[2] HW-20195, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, February 5, 1951, General Electric Company, Richland, Washington.

[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e g., Ru, Nb, and Zr) had not decayed appreciably.

3.1.1 221-T and 221-B Plant Cell Drainage Waste

During the operation of the 221-B and 221-T Bismuth Phosphate plants, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B and 221-T Plants contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High activity waste collected in 221-T Plant and 221-B Plant tanks 5-9 could be jetted to single-shell tank 241-T-107 and 241-B-107, respectively (HW-10475-C, page 918). Alternatively, the cell drainage waste could be transferred to process vessels with the 221-T (or 221-B) Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-DEL, page 28). The T-Plant stack drainage waste was also collected as part of the cell drainage until May 28, 1951, after which the stack drainage was routed to the cascade of single-shell tanks 241-TX-113, 241-TX-114, and 241-TX-115 (HW-21260-DEL, page 58).

The dissolvers located in 221-B and 221-T Plant cells 5, 6 and 7 were equipped with off-gas scrubber towers in May 1948 (HAN-45807, pages 57). The dissolver off-gas scrubbers used water to adsorb iodine and remove particulates from the dissolver off-gases. The spent scrubber solution was combined with the low-activity cell drainage waste collected in tank 5-6 (HW-10728). The dissolver off-gas scrubbers were replaced with silver chemical reactors, thus eliminating the spent scrubber solution. The first silver reactor was installed in the 221-B Plant in October 24, 1950 (HW-19898 and HW-19325, page 52) and the remaining silver chemical reactors were installed in the 221-B and 221-T Plants by January 1951 (HW-20161, page 52 and HW-21826).

Cell drainage waste collected in tank 5-6 was transferred to reverse well number 216-T-3 from January 1945 through August 1946. Crib number 216-T-6 was used to dispose of the cell drainage waste from August 1946 through June 1951. After June 1951, cell drainage waste was transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 (HW-55176, part V). The quantity and composition of the cell drainage solutions discharged from tank 5-6 varied (see HW-20583, page 4, and HW-33591, page 25).

3.1.2 221-T Shutdown

On March 20, 1956, the processing of irradiate nuclear fuel within the 221-T Plant was halted and cleanout of process vessels was initiated (HW-42219-DEL, page Ed-4). The cleaning of process vessels was conducted using nitric acid solutions to remove residual plutonium and fission products from the equipment. The nitric acid solutions were processed through the normal flowsheet to recover the plutonium. The nitric acid solution cleaning of the 221-T Plant process vessels was completed in June 1956 (HW-43938-DEL, page Ed-5). Peroxide and caustic flushing of process vessels in 221-T Plant was conducted in July 1956, with insignificant recovery of any additional plutonium. The peroxide and caustic flush solutions were discarded as waste to the single-shell tanks (HW-44580-DEL, page Ed-5). Cleaning of process vessels in the 221-T Plant was completed in September 1956, and the plant was placed in standby status (HW-45707-DEL, page D-5). In March 1957, the 221-T Bismuth Phosphate Plant was placed in layaway status (HW-51889).

3.1.3 221-T Equipment Decontamination Facility

In October 1958, plans were developed to convert the T-Plant for use as decontamination facility for equipment from the REDOX plant (HW-58051-DEL, page D-5). Work was conducted from February 1959 (HW-59434-DEL, page D-4) through June 1960 (HW-65935-DEL, page C-2) to convert the T-Plant. Equipment decontamination activities were initiated at the T-Plant in July 1960, with the receipt of a failed multipurpose dissolver from the REDOX plant (HW-66271-DEL, page C-2).

Equipment decontamination waste was transferred to various cribs and to single-shell tanks, including tank 241-T-105 (see Section 2.2.9). Crib number 216-TY-3 (renamed 216-T-28 crib) received equipment decontamination waste from T-Plant from February 1960 (HW-69071, page 23) through July 1966 (ISO-698, page 26). Crib number 216-T-28 was replaced by crib number 216-T-36, which received equipment decontamination waste from T-Plant from May 1967 (ARH-486, page 45) through February 1969 (ARH-1608, page 44). Disposal of equipment decontamination waste from T-Plant to a crib was discontinued after February 1969.

Table 7 lists the volume and radionuclide content of T-Plant equipment decontamination waste that was transferred to these cribs. No record could be located of the composition of T-Plant equipment decontamination waste that was transferred to single-shell tanks.

The curies of beta emitting radionuclides contained in the T-Plant equipment decontamination waste discharged to the crib begins to increase in 1962, reaching a maximum in 1965 and then decreases for 1966 through 1969. The increase in the curies of beta emitting radionuclides discharged from T-Plant corresponds with fission product processing activities at B-Plant and PUREX Plant. From September 1961 through January 1963, equipment within B-Plant cells 5 through 12 was replaced and/or modified for fission product processing (see Section 3.2.1). B-Plant, 244-CR Vault, 201-C Hot Semiworks, and a section of the PUREX Plant were operated from August 1963 through June 1966 to separate strontium-90 and rare earth fission products from PUREX high-level waste (see Section 3.2.1). Equipment from the fission product processing activities was decontaminated in T-Plant for repair and reuse.

In 1965, a program was implemented to reduce the radioactivity of wastes discharged to cribs (ARH-231, page 11), which corresponds with the decrease in the curies of beta emitting radionuclides discharged from T-Plant equipment decontamination activities. T-Plant equipment decontamination waste that contained radionuclides in excess of crib disposal limits was transferred to single-shell tanks for interim storage and processing in the 242-T Evaporator beginning in August 1965 (HW-83906-E RD, pages 68a and 68b).

Table 7. T-Plant Equipment Decontamination Waste Discharged to Cribs. (3 sheets)

Year	Month	Volume (Liters * 1E+06)	Uranium (kg)	Plutonium (grams)	Beta Emitters (curies)
1960 [(1)]	January				
	February	0.088	0.702	1.651	2.882
	March	0.062	4.54		6.787
	April	0.016	0.210	0.040	2.358
	May	0.061	2.504	0.143	1.738
	June	0.179	1.708	1.060	9.054
1960 [(2)]	July	0	0	0	0
	August	0.058	3.122	< 0.019	13.848
	September	0.067	0.225	0.195	0.122
	October	0.108	0.962	0.223	1.757
	November	0.067	0.009	0.212	0.009
	December	0.189	1.575	0.357	4.303
	Total for Year	0.895	15.562	3.90	43.858
1961 [(3)]	January	0.006	0.004	0.228	0.228
	February	0.130	8.014	0.175	11.224
	March	0.228	0.521	0.296	45.95
	April	0.117	2.98	0.147	5.318
	May	0.084	0.209	< 0.009	2.388
	June	0.276	1.989	0.375	16.622
1961 [(4)]	July	0.155	4.040	0.174	5.594
	August	0.220	2.429	2.902	13.188
	September	0.204	3.925	< 0.242	2.750
	October	0.170	1.045	0.103	76.944
	November	0.292	2.225	0.216	13.514
	December	0.306	1.736	0.237	9.169
	Total for Year	2.188	29.117	5.095	202.929
1962 [(5)]	January	0.21	1.9	0.12	26.4
	February	0.30	9.6	0.31	150.2
	March	0.33	3.8	4.00	36.8
	April	0.29	9.4	5.64	511.6
	May	0.06	0.1	0.02	38.5
	June				
	July	0.52	6.9	0.30	820.7
	August				
	September	0.35	1.4		394.3
	October	0.19	1.9		88.1
	November				
	December	0.40	5.9	0.11	128.4
	Total for Year	2.65	40.9	10.58	2,195
1963 [(6)]	January	0.19	2.42	0.036	241
	February	0.12	0.98	< 0.033	42
	March				
	April	0.29	2.58	0.093	675
	May	0.27	3.57	0.326	185
	June	0.19	1.34	0.114	504
	July	0.17	0.72	0.047	2,926
	August				

Table 7. T-Plant Equipment Decontamination Waste Discharged to Cribs. (3 sheets)

Year	Month	Volume (Liters * 1E+06)	Uranium (kg)	Plutonium (grams)	Beta Emitters (curies)
	September	0.20	2.02	0.052	134
	October	1.70	1.92	0.883	868
	November	1.75	1.57	1.575	1,215
	December	1.34	0.20	0	126
	Total for Year	6.2	17.3	3.14	6,916
1964 [7]	January	0.304	0.914	0.115	2,027
	February				
	March	0.380	5.475	0.231	4,196
	April				
	May	0.325	2.032	0.774	1,436
	June	0.190	1.414	0.311	2,042
	July				
	August	0.269	1.649	1.110	1,152
	September	0.200	3.850	0.053	3,923
	October				
	November	0.148	0.730	0.349	353
	December				
	Total for Year	1.82	16.1	2.94	15,129
1965 [8]	January	0.243	2.418	0.117	717.842
	February				
	March	0.281	3.375	0.696	626.670
	April	0.388	1.630	0.520	1,895.103
	May				
	June	0.255	2.710	0.262	1,360.975
	July	0.136	0.163	0.089	92.808
	August	0.351	3.206	0.557	13,736.176
	September				
	October				
	November				
	December	0.228	2.578	1.104	123.705
	Total for Year	1.882	15.080	3.345	18,533.279
1966 [9]	January				
	February	0.32	3.10	0.9	63.1
	March				
	April				
	May				
	June				
	July	0.31	4.79	0.1	91.5
	August				
	September				
	October				
	November				
	December				
	Total for Year	0.63	7.89	1.0	154.6
1967 [10]	January				
	February				
	March				
	April				
	May	0.067	0.208	0.20	30.7
	June	0.11	0.24	0.04	9.57

Table 7. T-Plant Equipment Decontamination Waste Discharged to Cribs. (3 sheets)

Year	Month	Volume (Liters * 1E+06)	Uranium (kg)	Plutonium (grams)	Beta Emitters (curies)
	July	0.053	0.001	0.002	21
	August	0.106	0.104	1.61	26.8
	September				
	October				
	November	0.035	0.136	0.6	4.1
	December				
	Total for Year	0.371	0.689	2.452	92.17
1968 [11]	January				
	February				
	March				
	April				
	May				
	June				
	July				
	August				
	September				
	October	0.051	0.121	0.0034	0.909
	November				
	December	0.051	0.241	0.028	0.10
	Total for Year	0.102	0.362	0.0314	1.009
1969 [12]	January				
	February	0.134	0.0006	0.0013	0.28
	March				
	April				
	May				
	June				
	July				
	August				
	September				
	October				
	November				
	December				
	Total for Year	0.134	0.0006	0.0013	0.28
1970 [13]	No waste transferred to crib for entire year. Waste discharge to cribs halted after February 1969.				

(1) HW-69071, page 23
(2) HW-69072, page 23
(3) HW-71971, page22
(4) HW-72956, page 22
(5) HW-76638, page 22
(6) HW-80877, page 22
(7) BNWC-91, page 21
(8) ISO-98, page 23
(9) ISO-698, page 26
(10) ARH-486, page 45
(11) ARH-1159, page
(12) ARH-1608, page 44
(13) ARH-2015, page 4

3.2 221-B Plant Fission Products Processing

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

3.2.1 Strontium and Rare Earths Processing

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, page B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144, and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, and cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead, and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.2.2 Cesium and Strontium Processing

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917). After separation of cesium, the alkaline supernatants were transferred directly to underground storage tanks. The ion exchange process used an ammonium carbonate / ammonium hydroxide solution to separate sodium from cesium on the ion exchange media. The aqueous wastes that contained ammonium were processed in the Cell 23 evaporator to concentrate these wastes and volatilize ammonia before transferred to underground storage tanks.

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PR-REPORT-SEP68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges. The PUREX high-level waste sludges were dissolved in nitric acid (known as PAS) in the 244-AR Vault and transferred to B-Plant for centrifugation to separate solids. The clarified solution was process in the solvent extraction equipment to separate strontium (PR-REPORT-SEP68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until 1977. The aqueous waste from the solvent extraction process was evaporated in the Cell 23 evaporator and transferred to underground storage tanks.

3.3 REDOX Continuous Solvent Extraction Processes

The REDOX plant (202-S building) was operated from 1952 through 1966 to reprocess spent nuclear fuels. The bulk of the nuclear fuel elements reprocessed at the REDOX plant were coated with aluminum, which is sometimes referred to as cladding. Some zirconium-clad fuel was also processed in the REDOX plants in 1963 through 1966. A summary of processing activities at the REDOX plant is provided in RHO-CD-505-RD, *Synopsis of REDOX Plant Operations*.

In the REDOX plant, aluminum coated uranium fuel elements that had been irradiated at the Hanford Site reactors was reprocessed to recover uranium and plutonium (HW-38684). The first step in the reprocessing at the REDOX facility was the dissolution of the aluminum coating from the spent nuclear fuel elements. The fuel elements were placed in a dissolver vessel, and sodium hydroxide and sodium nitrate solutions were added. The solution was heated to boiling to promote dissolution of the aluminum coating from the uranium fuel elements. The coating removal waste (designated as CW) from the aluminum-clad fuel was inherently alkaline and did not require neutralization before transfer to underground single-shell tanks. The coating waste solution contained approximately 0.03 percent of the uranium and 0.04 percent of the plutonium originally in the spent nuclear fuel element (HW-38684, page 9). Table 8 provides analytical results for a sample of the REDOX coating removal waste, which was reported in March 1953 (DDTS-Generated-607, 1953, "Proposed Cribbing of REDOX Coating Removal Solution").

Table 8. Analysis of REDOX Coating Removal Waste.

Analyte	Concentration
Uranium	0.16 g/L
Plutonium	150 μg/L
Beta emitters	2500 μCi/L
NaOH	3.5%
$NaNO_3$	4.9%
$NaAlO_2$	8.2%
Na_2SiO_3	0.1%
$NaNO_2$	5.2%
H_2O	78.1%
pH	12 to 13

Next, the uranium metal was dissolved in nitric acid. The dissolved uranium metal solution contained approximately 99.97 percent of the uranium and 99.96 percent of the plutonium originally in the spent nuclear fuel element. The uranium metal solution was reacted with an oxidizing chemical (dichromate solution) and then processed through a series of solvent extraction cycles using methyl isobutyl ketone solvent to separate uranium and plutonium from fission products. The fission products and impurities separated during the uranium and plutonium solvent extraction process were neutralized and transferred to single-shell underground storage tanks, forming supernatant and sludges within the tanks. The plutonium solutions generated at the REDOX plant were transferred to the 234-5Z building (Z-Plant) for further processing. Uranium solutions were transferred to 224-U building (UO_3 Plant) for conversion to an oxide, which was transferred to offsite facilities for re-use in the fabrication of nuclear fuel.

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-T-105

A total of five core samples of the sludge contained in tank 241-T-105 were obtained in March 1993, June 1993 and June 1997 and analyzed to determine radiochemical and chemical concentrations. These core sample analyses and engineering judgment are applied to form the best basis inventory for the waste stored in this tank (http://twins.pnl.gov/). These core samples did not reach the bottom 12 inches of the 2C waste layer in this tank, therefore a waste template was used to estimate the composition of this waste layer. Americium-241 and neptunium-237 were calculated for the upper sludge (1C and CW) using total alpha data and the individual template isotopic distribution ratios. Plutonium-239 and plutonium-240 were calculated from the measured Pu-239/240 and the isotopic distribution template ratios. Americium, neptunium and plutonium alpha-emitting radionuclides were calculated for the lower 12 inches of sludge using the 2C sludge template isotopic distribution ratios and sample data for the total alpha activity.

Table 9 provides the best-basis inventory for transuranic elements (i.e., Np-237, Pu-238, Pu-239, Pu-240, and Am-241) contained in the tank 241-T-105 sludge, as reported on October 11, 2004. The concentration of transuranic elements in the waste stored in tank 241-T-105 is approximately 427.4 ηCi/g. The concentrations of cesium-137 and strontium-90 present in the waste stored in tank 241-T-105 are also provided in Table 9. The cesium-137 and strontium-90 concentrations are based on analyses of the core samples and a waste template used to estimate the composition of the bottom (2C sludge) 12-inches of waste in tank 241-T-105. The cesium-137 and strontium-90 concentrations are approximately 10.5 μCi/g and 58.7 μCi/g, decay corrected to January 1, 2004.

The inventories of transuranic elements, cesium-137, and strontium-90 present in tank 241-T-105 are also compared to the inventory of these radionuclides present in all 177 underground storage tanks at the Hanford Site in Table 8. The inventory of transuranic elements present in tank 241-T-105 is approximately 0.096 percent of the total inventory of transuranic elements present in all 177 underground storage tanks at the Hanford Site. The inventories of cesium-137 and strontium-90 present in tank 241-T-105 are approximately 0.012 percent and 0.055 percent of the total inventory of cesium-137, and strontium-90 present in all 177 underground storage tanks at the Hanford Site.

Table 9. Transuranic Elements and Fission Products in Tank 241-T-105.

Tank	TRU		Cs-137		Sr-90	
	ηCi/g	Ci	μCi/g	Ci	μCi/g	Ci
241-T-105	427.4	204.7	10.4	5,000	58.7	28,100
All 177 Tanks	Not applicable	214,067	Not applicable	43,000,000	Not applicable	51,900,000
241-T-105 waste as a percentage of all 177 tanks		0.096%		0.012%		0.055%

5.0 SUMMARY

The waste types received in tank 241-T-105 and their disposition are summarized in Table 10. Based on the waste transfer history, the sludge stored in tank 241-T-105 is comprised of 2C and 1C/CW sludges from the 221-T Bismuth Phosphate Plant, T-Plant equipment decontamination waste, and REDOX CW sludge. The interstitial liquid present in these sludges is principally B-Plant low-level waste / cesium ion exchange waste.

The concentration of transuranic elements present in the sludge stored in tank 241-T-105 is approximately 427.4 ηCi/g. The concentrations of cesium-137 and strontium-90 in the sludge contained in tank 241-T-105 are approximately 10.4 μCi/g and 58.7 μCi/g, respectively.

Table 10. Waste Transfer History for Tank 241-T-105. (2 sheets)

Date	Waste Type	Source / Destination	Disposition	Waste Volume in Tank 241-T-105	
				Supernatant (gallons)	Sludge (gallons)
07/1946 to 03/1948	2C	221-T Plant	Received 1,060,000 gallons of 2C waste. Cascaded ~530,000 gallons into tank 241-T-106. 2C waste precipitated solids during storage.	530,000 total	
04/1948	2C Supernatant	To Crib	Discharged 360,000 gallons of 2C supernatant from tank 241-T-105 to crib. [Discharged 2C supernatant from tank 241-T-106 to crib in 08/1948]	161,030	
05/1948 to 02/1949	1C/CW	221-T Plant	Received ~890,000 gallons of 1C/CW waste. Cascaded ~530,000 gallons into tank 241-T-106. 1C/CW waste precipitated solids during storage.	530,000 total	
04/1951	1C/CW Supernatant	To 242-T	Transferred 1,150,000 gallons of 1C/CW supernatant to 242-T Evaporator for concentration.	Not Specified	Not Specified
08/1951 to 12/1951	1C/CW	221-T Plant	Received ~1,120,000 gallons of 1C/CW waste into cascade of tanks 241-T-104, 241-T-105, and 241-T-106.	381,000	149,000
01/1954	1C/CW Supernatant	To Trench	Transferred 386,375 gallons of 1C/CW supernatant to trench.	4,000	149,000
03/1954 to 08/1954	1C/CW	221-T Plant	Received ~1,120,000 gallons of 1C/CW waste into cascade of tanks 241-T-104, 241-T-105, and 241-T-106.	333,000	197,000
11/1954 to 12/1954	1C/CW Supernatant	To 242-T	Transferred 342,000 gallons of 1C/CW supernatant to 242-T Evaporator for concentration.	0	188,000
01/1955 to 03/1956	CW	221-T Plant	Received ~398,000 gallons of T-Plant CW waste. [Revised sludge measurement]	359,000	149,000
06/1965	CW	REDOX (From S-107)	Received 210,530 gallons of REDOX CW supernatant from tank 241-S-107 into tank 241-T-105. Cascaded 188,530 gallons of REDOX CW waste into tank 241-T-106. [Revised sludge measurement]	476,000	62,000

Table 10. Waste Transfer History for Tank 241-T-105. (2 sheets)

Date	Waste Type	Source / Destination	Disposition	Waste Volume in Tank 241-T-105	
				Supernatant (gallons)	Sludge (gallons)
01/1967	T-Plant CW / REDOX CW Supernatant	To 242-T	Transferred 407,000 gallons of CW supernatant to 242-T Evaporator for concentration.	66,000	62,000
03/1967 to 06/1967	Hanford Laboratory Waste	HLO	Received 396,000 gallons of Hanford Laboratory Waste (HLO).	462,000	62,000
12/1967	T-Plant CW / REDOX CW Supernatant	To 242-T	Transferred 396,000 gallons of CW supernatant to 242-T Evaporator for concentration.	66,000	62,000
1Q/1968 to 2Q/1968	T-Plant DW	221-T Plant	Received 268,000 gallons equipment decontamination waste (DW) from 221-T Plant.	334,000	62,000
06/1968 to 07/1968	T-Plant DW	To REDOX	Transferred 288,000 gallons equipment decontamination waste (DW) to REDOX for evaporation.	47,000	62,000
2Q/1969	T-Plant DW	221-T Plant	Received 57,000 gallons equipment decontamination waste (DW) from 221-T Plant.	64,000	99,000
4Q/1972 to 3Q 1973	B-Plant LLW / IX Waste	241-BX-104	Received 831,000 gallons of B-Plant low-level waste (LLW) / cesium ion exchange (IX) process waste from tank 241-BX-104. Transferred 455,000 gallons to tanks 241-T-106.	439,000	100,000
2Q/1974	B-Plant LLW / IX Waste and T-Plant DW	To 242-S Evaporator	Transferred 425,000 gallons of supernatant from tank 241-T-105 to tank 241-S-110 for processing in the 242-S Evaporator.	13,000	100,000
02/1976 to 04/1978	Supernatant and Interstitial Liquids	To Tank 241-T-101	Saltwell pumped tank as part of interim stabilization program. Removed 28,196 gallons of liquid from tank.	0	114,000
02/2003			Current sludge measurement (HNF-EP-0182, Rev. 179)	0	98,000

Notes:

1C = First decontamination cycle waste
2C = Second decontamination cycle waste
CW = Coating removal waste
DW = Equipment decontamination waste
HLO = Hanford Laboratory waste
IX = Ion exchange
LLW = low-level waste

6.0 REFERENCES

60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey, May 17), Rockwell Hanford Operations, Richland, Washington.

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.

ARH-231, 1967, *Hanford Low Level Waste Management Reevaluation Study*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-486, 1968, *Radioactive Contamination in Liquid Waste Discharged to Ground within the Chemical Separations Area Control Zone through 1967*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary April 1, 1968 through June 30, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary July 1, 1968 through September 30, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1159, 1969, *Radioactive Contamination in Liquid Waste Discharged to Ground within the Chemical Separations Area Control Zone through 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary April 1, 1969 through June 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1608, 1970, *Radioactive Contamination in Liquid Waste Discharged to Ground within the Chemical Separations Area Control Zone through 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2015, 1970, *Radioactive Contamination in Liquid Waste Discharged to Ground in the 200 Areas During 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-917, 1977, *Evaluation of Phosphotungstic Acid Process for Removal of Cesium-137 from PUREX Current Acid Waste*, Atlantic Richfield Hanford Company, Richland, Washington.

BNWC-91, 1965, *Radioactive Contamination in Liquid Waste Discharged to Ground at the Separations Facilities through December 1964*, Battelle Northwest, Richland, Washington.

DDTS-Generated-607, 1953, "Proposed Cribbing of REDOX Coating Removal Solution," (letter from A. R. Keene to J. M. Smith, March 31), General Electric Company, Richland, Washington.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doc/culres/mpd/toc.htm, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

HAN-45762, 1946, *200 Area Daily Log for June 3, 1946 through December 31, 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HAN-90907, 1965, *Monthly Status and Progress Report for February 1965*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944 through December 1946*, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-45807-DEL, 1948, *200 Area Monthly Reports 1948*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-62359-DEL, 1955, *200 Area Monthly Reports for 1954*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-63671-DEL, 1951, *200 Area Monthly Reports for January 1, 1951 to December 31, 1951*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95105-DEL, 1966, *Monthly Status and Progress Report for June 1966*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95284-DEL, 1966, *Monthly Status and Progress Report for July 1966*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96590-DEL, 1967, *Monthly Status and Progress Report for Januar1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96805-DEL, 1967, *Monthly Status and Progress Report for February 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97066-DEL, 1967, *Monthly Status and Progress Report for March 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97300-DEL, 1967, *Monthly Status and Progress Report for April 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97845-DEL, 1967, *Monthly Status and Progress Report for May 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-98343-DEL, 1967, *Monthly Status and Progress Report for July 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-98918-DEL, 1967, *Monthly Status and Progress Report for October 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99396-DEL, 1967, *Monthly Status and Progress Report for December 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99604-DEL, 1968, *Monthly Status and Progress Report for January 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100127-DEL, 1968, *Monthly Status and Progress Report for March 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100357-DEL, 1968, *Monthly Status and Progress Report for April 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HNF-EP-0182, 2003, *Waste Status Summary Report for Month Ending February 28, 2003*, Rev. 179, CH2M HILL Hanford Group Inc., Richland, Washington.

HNF-SD-WM-ER-351, 1997, *Historical Tank Waste Content Estimate for the Northwest Quadrant of the Hanford 200 West Area*, Rev. 1, Fluor Daniel Northwest Inc., Richland, Washington.

HNF-SD-WM-ER-369, 1998, *Tank Characterization Report for Single-Shell Tank 241-T-105*, Rev. 2B, Lockheed Martin Hanford Corporation, Richland Washington

HNF-SD-RE-TI-178, 2003, *Single-Shell Tank Leak Stabilization Record*, Rev. 8, CH2M HILL Hanford Group Inc., Richland Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*,

E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10321, 1948, *Cribbing – Second Cycle Waste*, General Electric Company, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10728, 1948, "Process Waste Data – 200 Areas," (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19898, 1951, *Efficiency Evaluation of the Dissolver Cell Silver Reactor and Fiberglas Filter*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21826, 1951, *Variation in Silver Reactor Performance*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.

HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.

HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department, Separations Section, February 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW-31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling*

Separations – Operations, February 1954, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington.

HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.

HW-33184, 1954, *BiPO4 Plant Nickel Ferrocyanide Scavenging Flowsheet for First Cycle Waste Containing No Coating Removal Waste*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33585-DEL, 1954 *Hanford Atomic Products Operation Monthly Report for October 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section*, Separations – *Projects and Personnel Development Sub-section, November 30, 1954*, General Electric Company, Richland, Washington.

HW-34147-DEL, 1955 *Hanford Atomic Products Operation Monthly Report for December 1954*, General Electric Company, Richland, Washington.

HW-34281, 1954, *First Cycle Supernatant Ground Disposal*, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, December 31, 1954*, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, January 31, 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1955*, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1955*, General Electric Company, Richland, Washington.

HW-38684, 1955, *REDOX Chemical Flowsheet - HW No. 5*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, October 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1956, General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1956*, General Electric Company, Richland, Washington.

HW-42219-DEL, 1956, *Hanford Atomic Products Operation for March 1956*, General Electric Company, Richland, Washington.

HW-43938-DEL, 1956, *Hanford Atomic Products Operation for June 1956*, General Electric Company, Richland, Washington.

HW-44580-DEL, 1956, *Hanford Atomic Products Operation for July 1956*, General Electric Company, Richland, Washington.

HW-45707-DEL, 1956, *Chemical Processing Department Monthly Report for September 1956*, General Electric Company, Richland, Washington.

HW-46432-DEL, 1956, *Chemical Processing Department Monthly Report for October 1956*, General Electric Company, Richland, Washington.

HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51889, 1957, *Lay-Away of the Bismuth Phosphate, TBP, and Metal Removal Facilities*, General Electric Company, Richland, Washington.

HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-55176 – Pt. V, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.

HW-58051-DEL, 1958, *Chemical Processing Department Monthly Report for October 1958*, General Electric Company, Richland, Washington.

HW-59434-DEL, 1959, *Chemical Processing Department Monthly Report for February 1959*, General Electric Company, Richland, Washington.

HW-63051, 1961, *The Recovery of Fission Product Rare Earth Sulfates from PUREX IWW*, General Electric Company, Richland, Washington.

HW-65935-DEL, 1960, *Chemical Processing Department Monthly Report for June 1960*, General Electric Company, Richland, Washington.

HW-66271-DEL, 1960, *Chemical Processing Department Monthly Report for July 1960*, General Electric Company, Richland, Washington.

HW-69011, 1961, *Project CGC-897 – Title I Design Fission Product Storage in B Plant*, General Electric Company, Richland, Washington.

HW-69071, 1961, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through June 1960*, General Electric Company, Richland, Washington.

HW-69072, 1961, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1960*, General Electric Company, Richland, Washington.

HW-69534, 1961 *Laboratory Development of a Carrier Precipitation Process for the Recovery of Strontium from PUREX Wastes*, General Electric Company, Richland, Washington.

HW-71187-DEL, 1961, *Chemical Processing Department Monthly Report for September 1961*, General Electric Company, Richland, Washington.

HW-71971, 1961, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through July 1961*, General Electric Company, Richland, Washington.

HW-72956, 1962, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1961*, General Electric Company, Richland, Washington.

HW-76638, 1963, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1962*, General Electric Company, Richland, Washington.

HW-76848-DEL, 1963, *Chemical Processing Department Monthly Report for February 1963*, General Electric Company, Richland, Washington.

HW-77016, 1963, *B-Plant Phase I Information Manual*, General Electric Company, Richland, Washington.

HW-78817-DEL, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Richland, Washington.

HW-80877, 1964, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1963*, General Electric Company, Richland, Washington.

HW-81373, 1964, *Removal of Lead from B-Plant Cerium and Rare Earth Fractions*, General Electric Company, Richland, Washington.

HW-83906-E RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports July 1961 through December 1965*, General Electric Company, Richland, Washington.

ISO-98, 1966, *Radioactive Contamination in Liquid Waste Discharged to Ground at the Separations Facilities through December 1965*, ISOCHEM Inc., Richland, Washington.

ISO-698, 1967, *Radioactive Contamination in Liquid Waste Discharged to Ground at the Separations Facilities through December 1966*, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary January 1, 1967 Through March 31, 1967*, ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary April 1, 1967 Through June 30, 1967*, ISOCHEM INC., Richland, Washington.

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LET-092465, 1965, "242-T Evaporator Feed," (internal letter from W. L. Godfrey to S. J. Beard, September 24), General Electric Company, Richland, Washington.

MEM-010274, 1974, "Analysis of Tank Farm Samples 01/02/74 through 12/26/74 – Analysis of Tank Farm Samples, Sample: T-4927 Tank: 105-T," (internal memorandum from R. E. Wheeler to R. L. Walser, September 17), Atlantic Richfield Hanford Company, Richland, Washington.

PR-REPORT-JUL68-DEL, 1968, *Monthly Status and Progress Report July 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland, Washington.

PR-REPORT-SEP68-DEL, 1968, *Monthly Status and Progress Report September 1968*, U. S. Atomic Energy Commission Richland Operations Office, Richland Washington.

RHO-CD-505-RD, 1978, *Synopsis of REDOX Plant Operations*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SA-169, 1986, *Sixteen Years of Cesium Recovery Processing at Hanford's B Plant*, Rockwell Hanford Operations, Richland, Washington.

RL-SEP-197, 1965, *Chemical Processing Department Monthly Report December 1964*, General Electric Company, Richland, Washington.

RPP-13873, 2003, *Origin of Wastes in Single-shell Tanks 241-T-110 and 241-T-111*, CH2M HILL Hanford Group Inc., Richland, Washington.

RPP-16129, 2003, *Origin of Waste in Single-shell Tank 241-T-104*, CH2M HILL Hanford Group Inc., Richland, Washington.

RPP-16765, 2003, *Origin of Waste in Single-shell Tank 241-T-107*, CH2M HILL Hanford Group Inc., Richland, Washington.

SD-WM-TI-302, 1987, Hanford Waste Tank Sluicing History, Westinghouse Hanford Company, Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

APPENDIX A

VOLUME OF WASTE IN TANK 241-T-105

January 1945 through May 1977

This page intentionally left blank.

Table A-1. Volume of Wastes in Tank 241-T-105. (11 sheets)

Year	Month	Percentage filled	Reference	Page	Comments
1945	January[1]	Empty	HW-7-1293-DEL		No waste transferred into tank 241-T-105.
	February[1]	Empty	HW-7-1388-DEL	18	2C waste from 221-T Plant collected in tank 241-T-110. 1C/CW waste from 221-T Plant collected in tank 241-T-107.
	March[1]	Empty	HW-7-1544-DEL	21	Same as above.
	April[1]	Empty	HW-7-1649-DEL	20	Same as above.
	May[1]	Empty	HW-7-1793-DEL	22	Same as above.
	June[1]	Empty	HW-7-1981-DEL	23	Same as above.
	July[1]	Empty	HW-7-2177-DEL	22	Same as above.
	August[1]	Empty	HW-7-2361-DEL	21	Same as above.
	September[1]	Empty	HW-7-2548-DEL	22	Same as above.
	October[1]	Empty	HW-7-2706-DEL	21	Same as above.
	November[1]	Empty	HW-7-2957-DEL	21	Same as above.
	December[1]	Empty	HW-7-3171-DEL	21	Same as above.
1946	January[1]	Empty	HW-7-3378-DEL	24	Same as above.
	February[1]	Empty	HW-7-3566-DEL	21	Same as above.
	March[1]	Empty	HW-7-3751-DEL	21	Same as above.
	April[1]	Empty	HW-7-4004-DEL	21	Same as above.
	May[1]	Empty	HW-7-4193-DEL	21	Same as above.
	June[1]	Empty	HW-7-4343-DEL	23	Same as above.
	July[1]	0.2%	HW-7-4542-DEL	21 - 22	A new underground line was installed from diversion box 241-T-153 to tank 241-T-105. This allows tanks 241-T-105 and 241-T-106 to be filled independent from tank 241-T-104 (contains 1C/CW waste). 2C waste and stack drainage (steam condensate from dissolver jets) transferred from 221-T Plant to tank 241-T-105 beginning on July 22, 1946.
	August[1]	3.1%	HW-7-4739-DEL	23	2C waste and stack drainage transferred from 221-T Plant to tank 241-T-105.
	September[1]	4.1%	HW-7-5194-DEL	26	Same as above.
	October[1]	5.6%	HW-7-5362-DEL	28	Same as above.
	November[1]	11.2%	HW-7-5505-DEL	28	Same as above.
	December[1]	18.0%	HW-7-5630-DEL	25	Same as above.
1947	January[1]	23.1%	HW-7-5802-DEL	26	Same as above.
	February[1]	29.0%	HW-7-5944-DEL	25	Same as above.
	March[1]	34.4%	HW-7-6048-DEL	24	Same as above.
	April[1]	40.2%	HW-7-6184-DEL	26	Same as above.
	May[1]	48.1%	HW-7-6391-DEL	24	Same as above.
	June[1]	50.5%	HW-7-7454-DEL	26	Same as above.

Table A-1. Volume of Wastes in Tank 241-T-105. (11 sheets)

Year	Month	Percentage filled	Reference	Page	Comments
1947	July[1]	56.8%	HW-7283-DEL	26	Same as above.
	August[1]	63.6%	HW-7504-DEL	27	Same as above.
	September[1]	70.1%	HW-7795-DEL	27	Same as above.
	October[1]	74.3%	HW-7997-DEL	27	Same as above.
	November[1]	79.0%	HW-8267-DEL	29	Same as above.
	December[1]	84.4%	HW-8438-DEL	27	Same as above.
1948	January[1]	89.3%	HW-8931-DEL	28	Same as above.
	February[1]	92.3%	HW-9191-DEL	30	Same as above.
	March[1]	100%	HW-9595-DEL	32	Tanks 241-T-105 and 241-T-106 filled with 2C waste from the 221-T Plant. 2C waste from 221-T Plant collected in cascade of tanks 241-T-110, 241-T-111, and 241-T-112.
	April[2]	67.1%	HW-9922-DEL	31 - 32	Discharged 360,000 gallons of 2C waste supernatant from tank 241-T-105 to crib 241-T-3. Sludge height reports as 5 feet, 6 inches in tank 241-T-105 (HAN-45807-DEL, page 55). Plan to use tank 241-T-105 to receive 1C/CW waste from 221-T Plant. 2C waste from 221-T Plant collected in cascade of tanks 241-T-110, 241-T-111, and 241-T-112.
	May[2]	76.2%	HW-10166-DEL	33	1C/CW waste transferred from 221-T Plant to tank 241-T-105.
	June[2]	85.8%	HW-10378-DEL	30	Same as above.
	July[3]	69%	HW-10714-DEL	32 - 33	Discharged 2C waste from tank 241-T-106 to the 241-T-3 crib. 1C/CW waste transferred from 221-T Plant to tank 241-T-105.
	August[3]	70.3%	HW-10993-DEL	35 - 36	Completed on August 3, 1948 the discharge of 2C waste from tank 241-T-106 to crib 241-T-3. 1C/CW waste transferred from 221-T Plant to tank 241-T-105, which cascades to tank 241-T-106.
	September[3]	74.0%	HW-11226-DEL	33	Same as above.
	October[3]	79.0%	HW-11499-DEL	34	Same as above.
	November[3]	85.0%	HW-11835-DEL	36	Same as above.
	December[3]	94.0%	HW-12086-DEL	38	Same as above.
1949	January[3]	100%	HW-12391-DEL	38 - 39	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 and 241-T-107, 241-T-108, and 241-T-109 are filled with 1C/CW waste from 221-T Plant. Jumper changes made in diversion boxes 241-TX-153, 241-TX-154, and 241-TX-155 to divert 1C/CW waste from 221-T Plant to cascade of tanks 241-TX-109, 241-TX-110, 241-TX-111, and 241-TX-112.

Table A-1. Volume of Wastes in Tank 241-T-105. (11 sheets)

Year	Month	Percentage filled	Reference	Page	Comments
1949	February[3]	100%	HW-12666-DEL	35	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 filled with 1C/CW waste from 221-T Plant.
	March[3]	100%	HW-12937-DEL	41	Same as above.
	April[3]	100%	HW-13190-DEL	40	Same as above.
	May[3]	100%	HW-13561-DEL	42	Same as above.
	June[3]	100%	HW-13793-DEL	41	Same as above.
	July[3]	100%	HW-14043-DEL	43	Same as above.
	August[3]	100%	HW-14338-DEL	44	Same as above.
	September[3]	100%	HW-14596-DEL	43	Same as above.
	October[3]	100%	HW-14916-DEL	43	Same as above.
	November[3]	100%	HW-15267-DEL	45	Same as above.
	December[3]	100%	HW-15550-DEL	43	Same as above.
1950	January[3]	100%	HW-15843-DEL	45	Same as above.
	February[3]	100%	HW-17056-DEL	45	Same as above.
	March[3]	100%	HW-17410-DEL	49	Same as above.
	April[3]	100%	HW-17660-DEL	47	Same as above.
	May[3]	100%	HW-17971-DEL	45	Same as above.
	June[3]	100%	HW-18221-DEL	45	Same as above.
	July[3]	100%	HW-18473-DEL	46	Same as above.
	August[3]	100%	HW-18740-DEL	50	Same as above.
	September[3]	100%	HW-19021-DEL	49	Same as above.
	October	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-19325-DEL	50	Same as above.
	November	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-19622-DEL	49	Same as above.
	December	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-19842-DEL	51	Same as above.
1951	January	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-20161-DEL	50	Same as above.
	February	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-20438-DEL	50	Same as above.

Table A-1. Volume of Wastes in Tank 241-T-105. (11 sheets)

Year	Month	Percentage filled	Reference	Page	Comments
1951	March	3,145,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-20671-DEL	54 - 56	Transferred about 25,000 gallons of 1C/CW waste from one of the T-Farm tanks to TX tank in preparation for evaporation in the 242-T Evaporator.
	April	1,585,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-20991-DEL	52 - 53	Transferred about 1,115,000 gallons of 1C/CW waste from tanks 241-T-104, 241-T-105, and 241-T-106 to tanks 241-TX-117 and 241-TX-118 in preparation for evaporation in the 242-T Evaporator. Tanks 241-T-104, 241-T-105, and 241-T-106 contained 470,000 gallons of sludge after removal of supernatant. Tanks 241-T-107, 241-T-108, and 241-T-109 remain filled with 1C/CW waste.
	May	1,300,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-21260-DEL	56 - 58	242-T Evaporator started up in later part of April 1951. A total of 189,046 gallons of 1C/CW waste processed through May 1948. A total of 1,379,000 gallons of 1C/CW waste transferred from 241-T Farm to 241-TX Farm as feed for 242-T Evaporator.
	June	875,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-21506-DEL	55 - 57	A total of 406,568 gallons of 1C/CW waste processed in June 1948 in the 242-T Evaporator. A total of 1,908,625 gallons of 1C/CW waste transferred from 241-T Farm to 241-TX farm as feed for 242-T Evaporator.
	July	322,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-21802-DEL	41 - 42	A total of 539,083 gallons of 1C/CW waste processed in July 1948 in the 242-T Evaporator. A total of 2,296,125 gallons of 1C/CW waste transferred from 241-T Farm to 241-TX farm as feed for 242-T Evaporator. This completes the processing of settled 1C/CW waste supernatant from 241-T Farm in the 242-T Evaporator.
	August	Not Reported	HW-22075-DEL		
	September	Not Reported	HW-22304-DEL		
	October	Not Reported	HW-22610-DEL		
	November	Not Reported	HW-22875-DEL		
	December	Not Reported	HW-23140-DEL		

Notes:

[1] Percentage of tanks 241-T-105 and 241-T-106 filled with waste. Two tanks combined can retain nominally 1,060,000 gallons of waste.
[2] Percentage of tanks 241-T-104 and 241-T-105 filled with waste.
[3] Percentage of tanks 241-T-104, 241-T-105 and 241-T-106 filled with waste.

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1952	January	Not Reported	Not Reported	HW-23437-DEL		
	February	Not Reported	Not Reported	HW-23698-DEL		
	March	Not Reported	Not Reported	HW-23982-DEL		
	April	530,000	Not Reported	HW-27838	10	
	May	530,000	Not Reported	HW-27838	21	
	June	530,000	Not Reported	HW-27838	32	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 filled with 1C/CW waste on 3-31-1952. Plans are to process the supernatant in the 242-T Evaporator after allowing for decay of short-lived radionuclides.
	July	530,000	Not Reported	HW-27839	10	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 will be aged one-year to decay short-lived radionuclides.
	August	530,000	Not Reported	HW-27839	21	Same as above.
	September	530,000	Not Reported	HW-27839	32	Same as above.
	October	Not legible	Not Reported	HW-27840	10	
	November	530,000	Not Reported	HW-27840	21	Same as above.
	December	530,000	Not Reported	HW-27840	32	Same as above.
1953	January	530,000	Not legible	HW-27841	10	Sludge measurements taken on January 2, 1953.
	February	381,000	149,000	HW-27842	10	
	March	381,000	149,000	HW-27775	10	
	April	381,000	149,000	HW-28043	5	
	May	381,000	149,000	HW-28377	5	
	June	381,000	149,000	HW-28712	5	
	July	381,000	149,000	HW-29054	5	
	August	381,000	149,000	HW-29242	5	
	September	381,000	149,000	HW-29624	5	
	October	381,000	149,000	HW-29905	5	
	November	381,000	149,000	HW-30250	5	
	December	381,000	149,000	HW-30498	5	
1954	January	4,000	149,000	HW-30851	5	Transferred 1C/CW supernatant from tank 241-T-105 to trenches 241-T-1 (1/22/1954) and 241-T-2 (1/29/1954). See HW-33591, page 12.
	February	4,000	149,000	HW-31126	5	Tank 241-T-104 started to receive 1C/CW waste from 221-T Plant on 2/23/1954.

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1954	March	34,000	149,000	HW-31374	5	Tank 241-T-104 receiving 1C/CW waste from 221-T Plant. 1C/CW waste overflowing from tank 241-T-104 into tank 241-T-105.
	April	102,000	149,000	HW-31811	5	Same as above.
	May	287,000	149,000	HW-32110	5	Same as above.
	June	394,000	149,000	HW-32389	5	Tank 241-T-104 receiving 1C/CW waste from 221-T Plant. 1C/CW waste overflowing from tank 241-T-104 into tank 241-T-105, which started overflowing into tank 241-T-106 on 6/17/1954.
	July	397,000	149,000	HW-32697	5	Same as above.
	August	333,000	197,000	HW-33002	5	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 filled on August 26, 1954 (HAN-62359-DEL, September 8, 1954, page 21).
	September	333,000	197,000	HW-33396	5	Same as above.
	October	333,000	197,000	HW-33544	5	On October 20, 1954, 221-T Plant began treating the 1C waste with nickel ferrocyanide to precipitate cesium-137 and strontium-90. The "scavenged" 1C waste and precipitate are transferred to single-shell tanks. The coating removal waste from 221-T Plant is transferred separately to single-shell tanks.
	November	295,000	197,000	HW-33904	5	1C/CW supernatant in process of being transferred to tank 241-TX-118 for feed to the 242-T Evaporator.
	December	0	188,000	HW-34412	5	Tank 241-T-105 being held to receive coating removal waste beginning on 1/1/1955.
1955	January	38,000	188,000	HW-35022	5	Tank 241-T-105 receiving coating removal waste from 221-T Plant. Tank contains 1C/CW sludge and CW supernatant.
	February	78,000	188,000	HW-35628	5	Same as above.
	March	97,000	188,000	HW-36001	5	Same as above.
	April	119,000	188,000	HW-36553	5	Same as above.
	May	166,000	188,000	HW-37143	5	
	June	199,000	188,000	HW-38000	5	
	July	203,000	188,000	HW-38401	5	
	August	291,000	149,000	HW-38926	5	
	September	319,000	149,000	HW-39216	5	
	October	339,000	149,000	HW-39850	5	
	November	314,000	188,000	HW-40208	5	
	December	322,000	188,000	HW-40816	5	

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1956	January	326,000	188,000	HW-41038	5	
	February	359,000	149,000	HW-41812	5	Corrected electrode reading for tank level.
	March	359,000	149,000	HW-42394	5	
	April	359,000	149,000	HW-42993	5	
	May	359,000	149,000	HW-43490	5	
	June	359,000	149,000	HW-43895	5	
	July	359,000	149,000	HW-44860	5	
	August	381,000	149,000	HW-45140	5	
	September	381,000	149,000	HW-45738	5	
	October	342,000	188,000	HW-46382	5	
	November	342,000	188,000	HW-47052	5	
	December	342,000	188,000	HW-47640	5	
1957	January	352,000	188,000	HW-48144	5	Latest electrode reading.
	February	352,000	188,000	HW-48846	5	
	March	352,000	188,000	HW-49523	5	
	April	352,000	188,000	HW-50127	5	
	May	336,000	188,000	HW-50617	5	
	June	336,000	188,000	HW-51348	5	
	July	336,000	188,000	HW-51858	5	
	August	336,000	188,000	HW-52414	5	
	September	336,000	188,000	HW-52932	5	
	October	336,000	188,000	HW-53573	5	
	November	336,000	188,000	HW-54067	5	
	December	336,000	188,000	HW-54519	5	
1958	January	336,000	188,000	HW-54916	5	
	February	336,000	188,000	HW-55264	5	
	March	336,000	188,000	HW-55630	5	
	April	336,000	188,000	HW-55997	5	
	May	336,000	188,000	HW-56357	5	
	June	336,000	188,000	HW-56761	5	
	July	336,000	188,000	HW-57122	5	
	August	333,000	188,000	HW-57550	5	Latest electrode reading.
	September	333,000	188,000	HW-57711	5	
	October	333,000	188,000	HW-58201	5	
	November	333,000	188,000	HW-58579	5	

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1958	December	333,000	188,000	HW-58831	5	
1959	January	333,000	188,000	HW-59204	5	
	February	333,000	188,000	HW-59586	5	
	March	333,000	188,000	HW-60065	5	
	April	333,000	188,000	HW-60419	5	
	May	333,000	188,000	HW-60738	5	
	June	331,000	188,000	HW-61095	5	
	July	331,000	188,000	HW-61582	5	
	August	331,000	188,000	HW-61952	5	
	September	331,000	188,000	HW-62421	5	
	October	331,000	188,000	HW-62723	5	
	November	331,000	188,000	HW-63083	5	
	December	331,000	188,000	HW-63559	5	
1960	January	331,000	188,000	HW-63896	5	
	February	331,000	188,000	HW-64373	5	
	March	331,000	188,000	HW-64810	5	
	April	331,000	188,000	HW-65272	5	
	May	331,000	188,000	HW-65643	5	
	June	331,000	188,000	HW-66187	5	
	July	331,000	188,000	HW-66557	5	
	August	331,000	188,000	HW-66827	5	
	September	331,000	188,000	HW-67696	5	
	October	331,000	188,000	HW-67705	5	
	November	331,000	188,000	HW-68291	5	
	December	328,000	188,000	HW-68292	5	
1961	January through June	328,000	188,000	HW-71610	5	
	July through December	328,000	188,000	HW-72625	5	
1962	January through June	328,000	188,000	HW-74647	5	
	July through December	328,000	188,000	HW-76223	5	
1963	January through June	328,000	188,000	HW-78279	5	
	July through December	328,000	188,000	HW-80379	5	
1964	January through June	328,000	188,000	HW-83308	5	
	July through December	328,000	188,000	RL-SEP-260	5	

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1965	January through June	476,000	62,000	RL-SEP-659	5	Pumped 22,000 gallons of REDOX Plant coating removal waste from tank 241-S-107 into tank 241-T-105 in June 1965. Pumped an additional 188,530 gallons of REDOX Plant coating removal waste from tank 241-S-107 into tank 241-T-105 in June 1965, which cascaded into tank 241-T-106 (HW-83906-E-RD page 62c). No explanation in reference document for decrease in solids volume within tank 241-T-105.
	July through September	476,000	62,000	RL-SEP-821	5	
	October through December	473,000	62,000	RL-SEP-923	5	
1966	January through March	473,000	62,000	ISO-226	5	
	April through June	473,000	62,000	ISO-404	5	
	July through September	473,000	62,000	ISO-538	5	
	October through December	473,000	62,000	ISO-674	5	
1967	January through March	121,000	62,000	ISO-806	5	Transferred 407,000 gallons of supernatant from tank 241-T-105 to tank 241-TX-118 for processing in the 242-T Evaporator. Received 55,000 gallons of waste from Hanford Laboratory (HLO).
	April through June	462,000	62,000	ISO-967	5	Received 341,000 gallons of waste from Hanford Laboratory (HLO) into tank 241-T-105.
	July through September	462,000	62,000	ARH-95	6	
	October through December	66,000	62,000	ARH-326	6	Transferred 396,000 gallons of supernatant (CW/HLO) to 241-TX-118 for processing in the 242-T Evaporator.
1968	January through March	207,000	62,000	ARH-534	6	Transferred 141,000 gallons of equipment decontamination waste from 221-T Plant into tank 241-T-105.
	April through June	326,000	62,000	ARH-721	6	Transferred 127,000 gallons of equipment decontamination waste from 221-T Plant into tank 241-T-105. Transferred 9,000 gallons of supernatant from tank 241-T-105 to REDOX Plant for evaporation.
	July through September	47,000	62,000	ARH-871	6	Transferred 279,000 gallons of supernatant from tank 241-T-105 to REDOX Plant for evaporation.
	October through December	48,000	62,000	ARH-1061	7	
1969	January through March	45,000	62,000	ARH-1200 A	7	

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1969	April through June	102,000	62,000	ARH-1200 B	7	Transferred 57,000 gallons of equipment decontamination waste from 221-T Plant into tank 241-T-105.
	July through September	101,000	62,000	ARH-1200 C	7	
	October through December	64,000	99,000	ARH-1200 D	7	No explanation in reference document for increase in solids volume within tank 241-T-105.
1970	January through March	64,000	99,000	ARH-1666 A	7	
	April through June	64,000	99,000	ARH-1666 B	7	
	July through September	64,000	99,000	ARH-1666 C	7	
	October through December	64,000	99,000	ARH-1666 D	7	
1971	January through March	64,000	99,000	ARH-2074 A	7	
	April through June	63,000	100,000	ARH-2074 B	7	
	July through September	63,000	100,000	ARH-2074 C	7	
	October through December	64,000	100,000	ARH-2074 D	7	
1972	January through March	64,000	100,000	ARH-2456 A	6	
	April through June	63,000	100,000	ARH-2456 B	6	
	July through September	64,000	100,000	ARH-2456 C	6	
	October through December	379,000	100,000	ARH-2456 D	6	Transferred 316,000 gallons of B-Plant cesium ion exchange low-level evaporator process waste from 241-BX-104 into tank 241-T-105.
1973	January through March	440,000	100,000	ARH-2794 A	6	Transferred 63,000 gallons of B-Plant cesium ion exchange process waste from 241-BX-104 into tank 241-T-105. Transferred 4,000 gallons of supernatant from tank 241-T-105 into 241-T-106.
	April through June	439,000	100,000	ARH-2794 B	6	Transferred 452,000 gallons of B-Plant cesium ion exchange process waste from 241-BX-104 into tank 241-T-105 via tank 241-T-107. Transferred 451,000 gallons of supernatant from tank 241-T-105 into 241-T-106.
	July through September	436,000	100,000	ARH-2794 C	6	
	October through December	437,000	100,000	ARH-2794 D	6	
1974	January through March	437,000	100,000	ARH-CD-133 A	6	
	April through June	13,000	100,000	ARH-CD-133 B	6	Transferred 425,000 gallons of supernatant from tank 241-T-105 into tank 241-S-110 for processing in 242-S Evaporator.
	July through September	13,000	100,000	ARH-CD-133 C	6	

Table A-1. Volume of Waste in Tanks 241-T-105. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1974	October through December	13,000	101,000	ARH-CD-133 D	6	
1975	January through March	13,000	101,000	ARH-CD-336 A	6	
	April through June	13,000	101,000	ARH-CD-336 B	6	
	July through September	13,000	101,000	ARH-CD-336 C	6	
	October through December	13,000	101,000	ARH-CD-336 D	6	
1976	January through March	13,000	101,000	ARH-CD-702 A	6	Tank 241-T-105 removed from service. Transferred 1,000 gallons of supernatant to tank 241-T-101.
	April through June	0	114,000	ARH-CD-702 B	6	No explanation in reference document for increase in solids volume within tank 241-T-105.
	September	0	114,000	ARH-CD-702 I	14, 35	Conducting salt-well pumping in tank 241-T-105. Solids level measurement conducted 6/30/1976.
	October	0	114,000	ARH-CD-822-OCT	15	Same as above.
	November	0	114,000	ARH-CD-822-NOV	15	Same as above.
	December	0	114,000	ARH-CD-822-DEC	17	Same as above.
1977	January	0	114,000	ARH-CD-822-JAN	17	Same as above.
	February	0	114,000	ARH-CD-822-FEB	17	Same as above.
	March	0	114,000	ARH-CD-822-MAR	17	Same as above.
	April	0	114,000	ARH-CD-822-APR	17	Same as above.
	May	0	114,000	ARH-CD-822-MAY	17	Same as above.
1978	April	0	114,000	60410-78-092		Salt well pumping the interstitial liquid from tank 241-T-105 to tank 241-T-101 removed a total of 28,196 gallons of liquid from 2/1976 through 4/1978.

A1.0 REFERENCES

60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey, May 17), Rockwell Hanford Operations, Richland, Washington.

ARH-95, 1967, *Chemical Processing Division Waste Status Summary, July to September*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary April 1, 1968 through June 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary July 1, 1968 through September 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary October 1, 1968 through December 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 A, 1969, *Chemical Processing Division Waste Status Summary January 1, 1969 through March 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary April 1, 1969 through June 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary July 1, 1973 through September 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 A, 1976, *Production and Waste Management Division Waste Status Summary January 1, 1976 through March 31, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 B, 1976, *Production and Waste Management Division Waste Status Summary April 1, 1976 through June 30, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 I, 1976, *Production and Waste Management Division Waste Status Summary September 30, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-OCT, 1976, *Production and Waste Management Division Waste Status Summary October 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-NOV, 1976, *Production and Waste Management Division Waste Status Summary November 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-DEC, 1976, *Production and Waste Management Division Waste Status Summary December 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-JAN, 1977, *Production and Waste Management Division Waste Status Summary January 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-FEB, 1977, *Production and Waste Management Division Waste Status Summary February 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAR, 1977, *Production and Waste Management Division Waste Status Summary March 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-APR, 1977, *Production and Waste Management Division Waste Status Summary April 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAY, 1977, *Production and Waste Management Division Waste Status Summary May 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

HAN-45807-DEL, 1948, *200 Area Monthly Reports 1948*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-62359-DEL, 1954, *200 Area Monthly Reports for 1954*, Atomic Energy Commission, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1946,*Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.

HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.

HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.

HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.

HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, General Electric Company, Richland, Washington.

HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.

HW-15550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.

HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.

HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-23437-DEL, 1952, *Hanford Works Monthly Report for January 1952*, General Electric Company, Richland, Washington.

HW-23698-DEL, 1952, *Hanford Works Monthly Report for February 1952*, General Electric Company, Richland, Washington.

HW-23982-DEL, 1952, *Hanford Works Monthly Report for March 1952*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*, General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, May 31, 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations – Operations, June 30, 1953*, General Electric Company, Richland, Washington.

HW-29054, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, July 31, 1953*, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, August 31, 1953*, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, September 30, 1953*, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, October 31, 1953*, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW-31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, February 1954*, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, April 30, 1954*, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington

HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.

HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations – Engineering and Control, July 31, 1954*, General Electric Company, Richland, Washington.

HW-33002, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Projects and Personnel Development Sub-section, August 31, 1954*, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, September 31, 1954*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, November 30, 1954*, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, December 31, 1954*, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1955*, General Electric Company, Richland, Washington.

HW-35628, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1955*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 1955*, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1955*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1955*, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1955*, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, September 30, 1955*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, October 1955*, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, November 30, 1955*, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, December 31, 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1956*, General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1956*, General Electric Company, Richland, Washington.

HW-42394, 1956, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1956*, General Electric Company, Richland, Washington.

HW-42993, 1956, *Waste-Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1956*, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 31, 1956*, General Electric Company, Richland, Washington.

HW-43895, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1956*, General Electric Company, Richland, Washington.

HW-44860, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1956*, General Electric Company, Richland, Washington.

HW-45140, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1956*, General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department, Production Operation – Chemical Processing Department, September 30, 1956*, General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, October 1956*, General Electric Company, Richland, Washington.

HW-47052, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling Production Operation, November 30, 1956*, General Electric Company, Richland, Washington.

HW-47640, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, December 31, 1956*, General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, January 31, 1957*, Hanford Atomic Products, Richland, Washington.

HW-48846, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, February 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-49523, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, March 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50127, 1957, *Waste-Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, April 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50617, 1957, *Waste-Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, May 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51348, 1957, *Waste-Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, June 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51858, 1957, *Waste-Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52414, 1957, *Waste-Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste-Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste-Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54067, 1957, *Waste-Status Summary; Chemical Processing Department, November 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54519, 1957, *Waste-Status Summary; Chemical Processing Department, December 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54916, 1958, *Waste-Status Summary; Chemical Processing Department, January 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55264, 1958, *Waste-Status Summary; Chemical Processing Department, February 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55630, 1958, *Waste-Status Summary; Chemical Processing Department, March 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55997, 1958, *Waste-Status Summary; Chemical Processing Department, April 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56357, 1958, *Waste- Status Summary; Chemical Processing Department, May 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56761, 1958, *Waste- Status Summary; Chemical Processing Department, June 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57122, 1958, *Waste- Status Summary; Chemical Processing Department, July 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57550, 1958, *Waste- Status Summary; Chemical Processing Department, August 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57711, 1958, *Waste- Status Summary; Chemical Processing Department, September 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58201, 1958, *Waste- Status Summary; Chemical Processing Department, October 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58579, 1958, *Waste- Status Summary; Chemical Processing Department, November 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58831, 1959, *Waste- Status Summary; Chemical Processing Department, December 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-59204, 1959, *Waste- Status Summary; Chemical Processing Department, January 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-59586, 1959, *Waste- Status Summary; Chemical Processing Department, February 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60065, 1959, *Waste- Status Summary; Chemical Processing Department, March 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60419, 1959, *Waste- Status Summary; Chemical Processing Department, April 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60738, 1959, *Waste- Status Summary; Chemical Processing Department, May 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61095, 1959, *Waste- Status Summary; Chemical Processing Department, June 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61582, 1959, *Waste- Status Summary; Chemical Processing Department, July 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department, August 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department, September 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department, October 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department, November 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department, December 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63896, 1960, *Chemical Processing Department – Waste Status Summary, January 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64373, 1960, *Chemical Processing Department – Waste Status Summary, February 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65272, 1960, *Chemical Processing Department – Waste Status Summary, April 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-66187, 1960*Chemical Processing Department – Waste Status Summary, June 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66557, 1960, *Chemical Processing Department – Waste Status Summary, July 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66827, 1960, *Chemical Processing Department – Waste Status Summary, August 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67696, 1960, *Chemical Processing Department – Waste Status Summary, September 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67705, 1960, *Chemical Processing Department – Waste Status Summary, October 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68291, 1961, *Chemical Processing Department – Waste Status Summary, November 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68292, 1961, *Chemical Processing Department – Waste Status Summary, December 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-71610, 1961, *Chemical Processing Department – Waste Status Summary, January - June 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, July – December 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January – June 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-78279, 1963, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January - June 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-83308, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January – June 1964*, Hanford Atomic Products Operation, Richland, Washington.

HW-83906-E RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports July 1961 through December 1965*, General Electric Company, Richland, Washington.

ISO-226, 1966, *Chemical Processing Division – Waste Status Summary January 1, 1966 through March 31, 1966*, ISOCHEM INC., Richland, Washington.

ISO-404, 1966, *Chemical Processing Division – Waste Status Summary April 1, 1966 through June 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 through September 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary October 1, 1966 – December 31, 1966,* Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary January 1, 1967 Through March 31, 1967,* ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary April 1, 1967 Through June 30, 1967,* ISOCHEM INC., Richland, Washington.

RL-SEP-260, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1964 Through December 31, 1964,* Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965,* Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965,* Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965,* Hanford Atomic Products Operation, Richland, Washington.

JUL 11 2003
Sta 15

(22)

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 636202

2. To: (Receiving Organization) Waste Disposal Strategic Planning	3. From: (Originating Organization) Process Engineering	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: HPEH 0131 Supplemental Treatment 116707/A5602	6. Design Authority/Design Agent/Cog. Engr.: M.E. Johnson	7. Purchase Order No.: N/A
8. Originator Remarks: This document describes the different types of waste that were transferred into and removed from single-shell tank 241-T-107.		9. Equip./Component No.: N/A 10. System/Bldg./Facility: N/A 12. Major Assm. Dwg. No.: N/A
11. Receiver Remarks:	11A. Design Baseline Document? ☐ Yes ☒ No	13. Permit/Permit Application No.: N/A 14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	RPP-16765		0	Origin of Waste in Single-Shell Tank 241-T-107	N/A	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D OR N/A (See WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Authority				1	1	K. D. Boomer	K. D. Boomer	7/7/03	R1-44
		Design Agent									
1	1	Cog. Eng. M. E. Johnson	Michael E. Johnson	7/7/03	R1-44						
1	1	Cog. Mgr. S. M. Mackay	S. Mackay	7/8/03							
		QA									
		Safety									
		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
Michael E. Johnson M. E. Johnson 7/7/03 Signature of EDT Originator / Date	J. Kristofzski 7/10/03 J. Kristofzski Authorized Representative for Receiving Organization / Date	S. Mackay 7/8/03 S. M. Mackay Design Authority/ Cognizant Manager / Date	Ctrl No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments

DISTRIBUTION SHEET

To Distribution	From M. E. Johnson	Page 1 of 1
Project Title/Work Order Origin of Wastes in Single-Shell Tank 241-T-107		Date 07/08/03
		EDT No. 636202
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
K. D. Boomer	R1-44	x			
D. W. Cras	H6-19	x			
B. A. Higley	R1-44	x			
M. E. Johnson	R1-44	x			
J. G. Kristofzski	H6-03	x			
S. M. Mackay	R2-58	x			
R. E. Raymond	H6-03	x			
A. Tedeschi	H6-03	x			
T. M. Horner	S5-13	x			
N. W. Kirch	R1-44	x			
K. L. Hennesay	R1-10	x			
Central Files	B1-07	X			

Origin of Wastes in Single-Shell Tank 241-T-107

Michael E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 636202 UC: N/A
Cost Center: 116707/AJ60 Charge Code: 501546
B&R Code: N/A Total Pages: ~~73~~ 74 ew 7-11-03

Key Words: Hanford, single-shell tank, 241-T-107
first decontamination cycle (1C) waste, coating removal (CW) waste, cesium ion exchange waste, PUREX, B Plant, T Plant, bismuth phosphate

Abstract: A review of waste transfer documents was conducted to identify the origin of waste present in tank T-107. Tank T-107 received first decontamination cycle (1C) and coating removal waste (CW) from the 221-T Bismuth Phosphate Plant, scavenged TBP Plant supernatant, PUREX coating removal waste, and B Plant cesium ion exchange waste. The 1C/CW, scavenged TBP Plant, PUREX CW and B Plant ion exchange supernatants were all removed and dispositioned, leaving 1C/CW sludge in this tank.

JUL 11 2003
DATE:
HANFORD RELEASE
STA: 15
ID: 22

Chris Willingham 7-11-03
Release Approval Date Release Stamp

Approved For Public Release

RPP-16765
Revision 0

ORIGIN OF WASTE IN SINGLE-SHELL TANK 241-T-107

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
June 2003

CH2MHILL
Hanford Group, Inc.
Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

This page intentionally left blank.

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tank 241-T-107. This review was conducted to support decisions concerning disposition of the waste present in this tank.

Tank 241-T-107 presently contains approximately 173,000 gallons of sludge. Based on the waste transfer history, the sludge stored in tank 241-T-107 is comprised of first decontamination cycle waste (1C) and coating removal waste (CW) from operation of the 221-T Bismuth Phosphate Plant. The interstitial liquid present in the 1C/CW sludge is cesium ion exchange process waste from fission product processing conducted in B-Plant.

The concentration of transuranic elements in the tank 241-T-107 sludge is approximately 154.5 ηCi/g, which is consistent with the characteristics of 1C/CW sludge. The concentrations of cesium-137 and strontium-90 in the sludge contained in tank 241-T-107 are approximately 15.8 μCi/g and 108.4 μCi/g, respectively.

CONTENTS

1.0 INTRODUCTION 7

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-T-107 7
- 2.1 Description of Tank 241-T-107 7
- 2.2 Waste Transfers for Tank 241-T-107 9
  - 2.2.1 1C/CW Waste (February 1945 – March 1946) 9
  - 2.2.2 1C/CW Supernatant Evaporation (March 1951 – July 1951) 9
  - 2.2.3 TBP Plant Waste (November 1952 – January 1953) 10
  - 2.2.4 Evaporation of TBP Plant Waste Supernatant (August 1953) 10
  - 2.2.5 Scavenged TBP Supernatant (December 1953 – February 1954) 11
  - 2.2.6 Evaporation of Scavenged TBP Supernatant (October 1966 to December 1966) 12
  - 2.2.7 Coating Removal Waste (January 1967 to June 1967) 13
  - 2.2.8 Evaporation of Coating Removal Waste (October 1969 to December 1969) 14
  - 2.2.9 B-Plant Cesium Ion Exchange Waste (January 1973 to June 1973) 14
  - 2.2.10 Saltwell Pumping Interim Stabilization (February 1976 to September 1995) 16
  - 2.2.11 Comparison with Other Reports 17

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 18
- 3.1 221-B and 221-T BISMUTH PHOSPHATE PROCESS PLANT 18
  - 3.1.1 221-T and 221-B Plant Cell Drainage Waste 25
  - 3.1.2 221-T Equipment Decontamination Facility 25
- 3.2 221-B PLANT FISSION PRODUCTS PROCESSING 26
  - 3.2.1 STRONTIUM AND RARE EARTHS PROCESSING 26
  - 3.2.2 CESIUM AND STRONTIUM PROCESSING 27
- 3.3 PUREX PLANT 28
- 3.4 TRI-BUTYL PHOSPHATE (TBP) PLANT 29

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-T-107 31

5.0 SUMMARY 32

6.0 REFERENCES 33

APPENDIX

A. VOLUME OF WASTE IN TANK 241-T-107 JANUARY 1945 THROUGH MAY 1977 .... A-1

FIGURES

Figure 1. Tank 241-T-107 Plan View.. 8

Figure 2. Bismuth Phosphate Process Diagram.. 21

TABLES

Table 1. Composition of Scavenged TBP Plant Waste in Tank 241-T-101.. 11

Table 2. Composition of Scavenged TBP Plant Waste Discharged to Crib.. 12

Table 3. Composition of Tank 241-T-107 Supernatant – Scavenged TBP Plant Waste.. 13

Table 4. Typical Composition of PUREX Coating Removal Waste.. 14

Table 5. Composition of Tank 241-T-107 Supernatant – B-Plant IX Waste.. 16

Table 6. Estimated Composition of Bismuth Phosphate Plant Wastes.. 22

Table 7. Analyses of Bismuth Phosphate Process Supernatants Stored.. 23

Table 8. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant.. 24

Table 9. Transuranic Elements and Fission Products in Tank 241-T-107.. 31

Table 10. Waste Transfer History for Tank 241-T-107.. 32

LIST OF TERMS

1C	first cycle of the bismuth phosphate plutonium decontamination process
2C	second cycle of the bismuth phosphate plutonium decontamination process
5-6	low activity cell drainage waste
CAW	Current Acid Waste
cc	cubic centimeters
Ci	Curies
CW	Coating waste
DOE	U.S. Department of Energy
ft	feet
g/L	grams per liter
g/mL	grams per milliliter
IX	Ion Exchange
<u>M</u>	molarity or moles per liter
MW	Metal waste
N	Normality
PAS	PUREX Acidified Sludge
PUREX	Plutonium Uranium Extraction Plant
REDOX	Reduction-Oxidation Plant
TBP	Tri-Butyl Phosphate
ηCi/g	nanocuries per gram
μCi/cc	microcuries per cubic centimeters
μCi/g	microcuries per gram
μCi/L	microcuries per liter
μCi/mL	microcuries per milliliter
μg/cc	micrograms per cubic centimeters
μg/L	micrograms per liter
°C	degrees Celsius

1.0 INTRODUCTION

The origin of the waste in tank 241-T-107 has been reviewed to provide information for determining the disposition of this waste. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tank 241-T-107. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to single-shell tank 241-T-107. Section 4.0 provides a discussion on the radionuclide analyses of the waste in single-shell tank 241-T-107. Section 5.0 summarizes the waste types that were transferred into single-shell tank 241-T-107.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-T-107

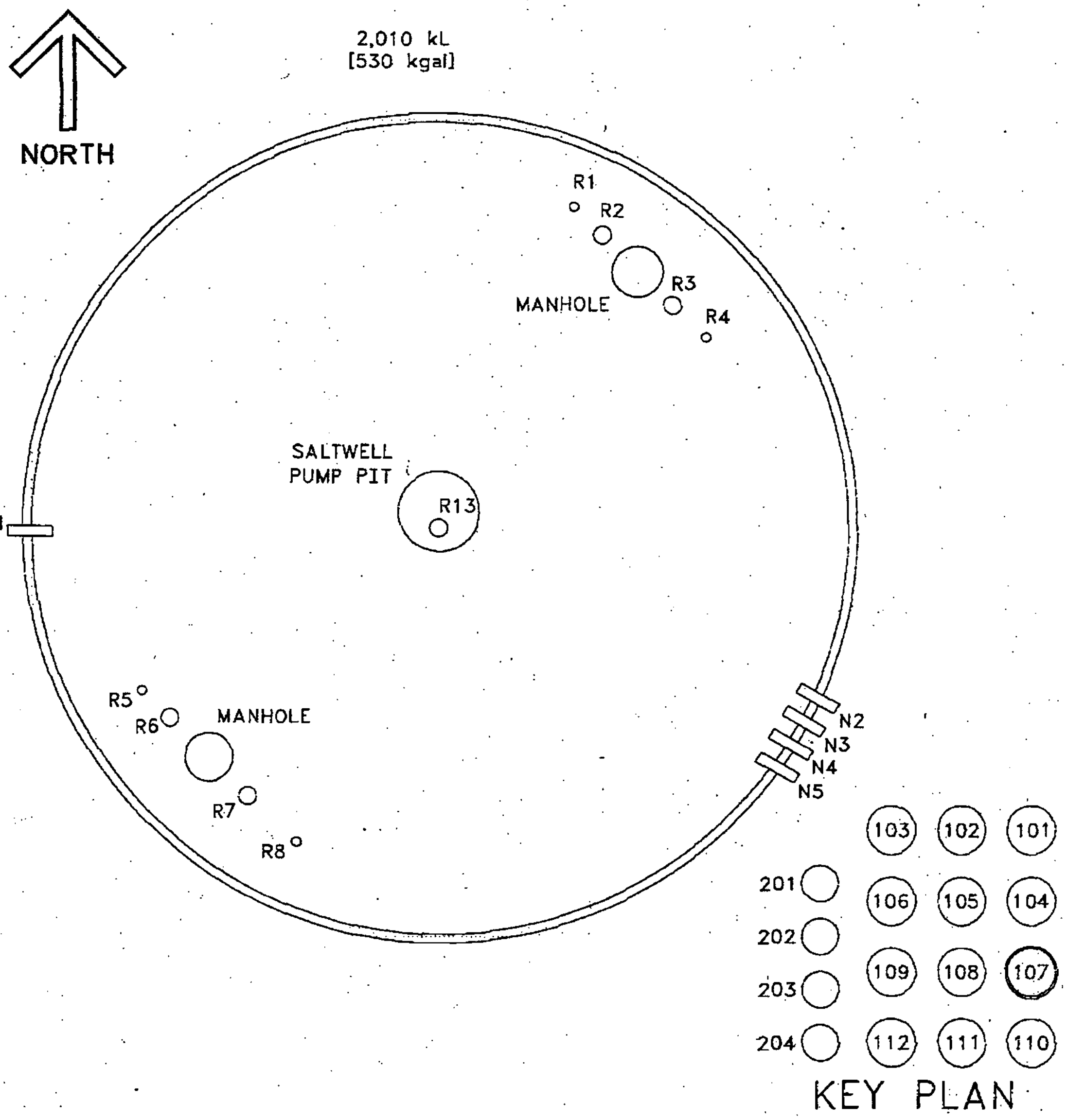
This section provides a brief description of single-shell tank 241-T-107 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the waste presently stored in single-shell tank 241-T-107, publicly available reports for the Hanford Site were reviewed. With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/ or the DOE Information Bridge at http://www.osti.gov/bridge/. The waste status summary reports are available only as photocopies from Hanford Site Central Files organization.

2.1 DESCRIPTION OF TANK 241-T-107

Single-shell tank 241-T-107 was originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX) and is one of the twelve, 100-series tanks in 241-T Tank Farm. Figure 1 provides a plan view of tank 241-T-107. The 100-series tanks are 75-ft diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. The steel liner extends to a height of 19 ft. Each 100-series tank has a design capacity of 530,000 gallons at a liquid depth of 16 ft and 8 inches. The 241-T Tank Farm also includes four 200-series tanks that are of similar construction as the 100-series tanks, but are only 20-ft diameter and each have a capacity of 55,000 gallons.

Single-shell tank 241-T-107 was connected via an underground overflow pipeline (nozzle N1 in Figure 1) to allow waste to cascade to tank 241-T-108. Tank 241-T-108 was also connected via a separate underground overflow pipeline to tank 241-T-109, which allowed waste to cascade from tank 241-T-107 into tank 241-T-108 and then into tank 241-T-109. In addition to the overflow piping, each tank is equipped with four, 3-inch diameter stainless steel inlet pipes. Originally, the four inlet pipes (nozzles N2 through N5 in Figure 1) on tank 241-T-107 were connected to diversion box 241-T-153. The four inlet pipes for tanks 241-T-108 and 241-T-109 were blanked off close to each tank when these tanks were constructed in 1944 (HW-10475-C, pages 907 and 908). Alterations to the piping network have occurred over the years.

Figure 1. Tank 241-T-107 Plan View.



2.2 WASTE TRANSFERS FOR TANK 241-T-107

Waste transfers into tank 241-T-107 and the operation of the tanks 241-T-107, 241-T-108, and 241-T-109 as a cascade are discussed in chronological order. A chronological listing is provided in Appendix A of waste transfers into and waste removal from tank 241-T-107 from 1945 through 1977. Section 3.0 describes the operation of the processing facilities that generated the waste types transferred into tank 241-T-107.

2.2.1 1C/CW Waste (February 1945 – March 1946)

Irradiated nuclear fuel was first processed in 221-T Plant beginning on December 26, 1944 (HW-7-1293-DEL, page 19). The first decontamination cycle (1C) waste was combined with the coating removal waste (CW) and transferred to the cascade of tanks 241-T-107, 241-T-108, and 241-T-109. The combined 1C/CW waste was reported as being collected in tank 241-T-107 in February 1945 (HW-7-1338-DEL, page 22).

Tank 241-T-107 was reported as being filled as of September 1, 1945, with 1C/CW waste overflowing to tank 241-T-108 (HW-7-2548-DEL, page 22). Tank 241-T-108 was reported as being filled as of December 10, 1945, with 1C/CW waste overflowing to tank 241-T-109 (HW-7-3171-DEL, page 21). Tanks 241-T-107, 241-T-108, and 241-T-109 continued to receive the combined 1C/CW waste until March 10, 1946, when these tanks were reported as being filled (HW-7-3751-DEL, page 20 and 21). The 1C/CW waste generated at the 221-T Plant was transferred to other single-shell tanks after March 10, 1946.

Prior to October 1945, the 1C/CW waste was neutralized to a pH of approximately 10 in 221-T Plant before transfer to the single-shell tanks (HW-3-3220, page 13). Beginning in October 1945, the pH of the 1C/CW waste was adjusted to approximately pH 7 in 221-T Plant before transfer to the single-shell tanks. This was done to cause the precipitation of bismuth and plutonium in the 1C/CW waste so that the supernatant would contain a lower concentration of plutonium (HW-7-2706-DEL, page 21). As a result, tank 241-T-107 contained settled 1C/CW solids (i.e., bismuth and plutonium precipitate) and 1C/CW supernatant.

2.2.2 1C/CW Supernatant Evaporation (March 1951 – July 1951)

The 1C/CW waste stored in tank 241-T-107 sat undisturbed until May 1951. The 1C/CW supernatant contained in tanks in 241-T Farm was transferred to tanks 241-TX-117 and 241-TX-118 for processing in the 242-T Evaporator. Supernatant from tanks 241-T-104, 241-T-105, and 241-T-106 were transferred to tanks 241-TX-117 and 241-TX-118 in April 1951 (HW-20991-DEL, page 53), leaving an estimated 470,000 gallons of sludges in these tanks. Supernatant from tanks 241-T-107, 241-T-108, and 241-T-109 were transferred to tanks 241-TX-117 and 241-TX-118 in May 1951 (HW-21260-DEL, pages 57 and 58), June 1951 (HW-21506-DEL, page 57), and July 1951 (HW-21802-DEL, page 42).

Tanks 241-T-107, 241-T-108, and 241-T-109 contained a total of 322,000 gallons of waste after removal of the 1C/CW supernatant. Tanks 241-T-107, 241-T-108, and 241-T-109 were reported in April 1952 to contain 245,000, 73,000, and 4,000 gallons of 1C/CW waste, respectively (HW-27838, page 10). No waste transfers were made into or waste removal from tank 241-T-107 until November 1952.

The 1C/CW supernatant was transferred from tanks 241-TX-117 and 241-TX-118 to the 242-T Evaporator for evaporation. Processing of the 1C/CW supernatant from the 241-T Farm tanks in the 242-T Evaporator was conducted from April 28, 1951 (HW-20991-DEL page 54 and HAN-63671-DEL, page 40) through July 1951 (HW-21802-DEL, page 42). The concentrated 1C/CW supernatant waste (i.e., evaporator bottoms) was stored in tank 241-TX-116 and 241-TX-117. The evaporator bottoms in tanks 241-TX-116 and 241-TX-117 were eventually processed again through the 242-T Evaporator to further concentrate these wastes for storage in tanks 241-TX-110 and 241-TX-111.

2.2.3 TBP Plant Waste (November 1952 – January 1953)

After evaporating the 1C/CW supernatant, tank 241-T-107 contained approximately 245,000 gallons of 1C/CW sludge and interstitial liquid. A separate measurement of the 1C/CW solids volume in tank 241-T-107 was not made.

Tank 241-T-107 began to receive waste from the Tri-Butyl Phosphate (building 221-U) Plant on November 17, 1952 (HW-27840, page 21). The Tri-Butyl Phosphate (TBP) Plant waste was stored atop the 1C/CW waste already present in tank 241-T-107. Tank 241-T-107 was operated as a cascade with tanks 241-T-108 and 241-T-109. When tank 241-T-107 was filled with TBP Plant waste and 1C/CW waste on November 26, 1952, waste began to overflow into tank 241-T-108 (HW-27840, page 21). Tank 241-T-108 was reported as being filled with waste on December 11, 1952, with waste then overflowing to tank 241-T-109 (HW-27840, page 32). Tank 241-T-109 was reported as filled in January 1953 (HW-27841, page 10).

After being filled with waste from the TBP Plant, tank 241-T-107 was reported to contain 201,000 gallons of sludge and 335,000 gallons of supernatant (HW-27841, page 10). The mixture of TBP Plant supernatant and 1C/CW sludge stored in tank 241-T-107 sat undisturbed until August 1953.

2.2.4 Evaporation of TBP Plant Waste Supernatant (August 1953)

In August 1953, the TBP Plant supernatant was transferred from tank 241-T-107 as well as tanks 241-T-108 and 241-T-109 to tank 241-TX-118 for processing in the 242-T Evaporator (HW-29242, page 5). Tank 241-T-107 contained 33,000 gallons of supernatant and 201,000 gallons of sludge after the TBP Plant waste supernatant was transferred to tank 241-TX-118. The TBP Plant supernatant was evaporated and transferred to tank 241-TX-117, then to tank 241-T-109 for storage (HW-29905, page 5 and HW-30250, page 5).

2.2.5 Scavenged TBP Supernatant (December 1953 – February 1954)

From October 11, 1953 to October 18, 1953, operators in the TBP Plant conducted a process test to precipitate cesium-137 and strontium-90 in the TBP Plant waste (HW-31428 and HW-36979 A, page 24). Cesium-137 and strontium-90 were precipitated by adding potassium ferrocyanide, sodium hydroxide, and nickel sulfate to the acidic TBP Plant Waste (HW-29383). The resulting nickel ferrocyanide precipitate (approximately 36,000 gallons) and scavenged TBP Plant supernatant was transferred to tank 241-T-101 in October 1953 (HW-45165-RD, pages 50 and 52). The TBP Plant waste had not been concentrated before transfer to tank 241-T-101.

Tank 241-T-101 received approximately 500,000 gallons of nickel ferrocyanide precipitate and scavenged TBP Plant supernatant. Samples of the waste received in tank 241-T-101 were obtained 3-days after filling the tank at 3 ft, 8 ft, and 13 ft elevations from the tank surface. These samples were analyzed to determine the concentrations of cesium and strontium as well as pH of the waste. Table 1 provides the analytical results for the scavenged TBP Plant waste samples obtained from tank 241-T-101 (HW-29814 and HW-31428).

Table 1. Composition of Scavenged TBP Plant Waste in Tank 241-T-101.

Sample	pH	Cesium (µCi/mL)	Cesium Decontamination Factor	Strontium (µCi/mL)	Strontium Decontamination Factor
Tank ½ filled	11.7	1.5	12	0.028	270
3 ft	9.8	0.044	660	0.027	287
8 ft	9.8	Not measured		0.030	254
13 ft	13.6	2.3	12	0.004	2,000

Based on these sample analyses, the scavenged TBP Plant waste appeared to be present as stratified layers in tank 241-T-101. A decision was made to discharge only the top 8 ft of waste in tank 241-T-101 to a crib. The nickel ferrocyanide precipitate was allowed to settle in tank 241-T-101. On December 8, 1953, approximately 256,000 gallons of the scavenged TBP Plant supernatant were transferred from tank 241-T-101 to crib number 241-T-17 (HW-30498, page 5, HW-33591, page 27 and HW-45165-RD, page 69). The average radionuclide concentrations in the supernatant based on seven samples taken during discharged to crib number 241-T-17 (later renumbered 216-T-18) are provided in Table 2.

The remaining 242,000 gallons of scavenged TBP Plant supernatant were transferred from tank 241-T-101 to tank 241-T-107 in December 1953 (HW-30498, page 5 and HW-45165-RD, page 69). The volume of solids present in tank 241-T-107 remained unchanged at 201,000 gallons following the receipt of the scavenged TBP Plant supernatant.

Table 2. Composition of Scavenged TBP Plant Waste Discharged to Crib.

Analyte	Concentration (µCi/mL)	Total Curies
Plutonium	9.2E-05	0.089
Uranium	5.6E-05	0.054
Cesium	0.27	290
Strontium	0.05	49
Ruthenium	0.19	180
Antimony	0.14	130
Rare Earths + Yttrium	0.20	190
Total Beta (sum of above)	0.85	840
pH	9.7	
Volume (gallons)	256,000	

The ferrocyanide precipitate remaining in tank 241-T-101 was flushed three times with water in an attempt to transfer the precipitate to tank 241-T-107 (HW-30851, page 5). However, these flushes were not successful in transferring the nickel ferrocyanide ($Ni_2Fe(CN)_6$) precipitate to tank 241-T-107. Visual inspection of tank 241-T-101 after conducting these flushes indicated that "… large quantities of $Ni_2Fe(CN)_6$ sludge cover large areas of the tank that were not reached by the water that was used to flush the tank …" (HW-36979 B, pages 88). The U.S. Atomic Energy Commission's 200 Area monthly report for January 1954 also stated that the heel of scavenged TBP Plant waste remained in tank 241-T-101 (HAN-62359-DEL, January 1954, page 40).

The volume of solids present in tank 241-T-107 remained unchanged at 201,000 gallons following receipt of the flush solutions from tank 241-T-101. The volume of scavenged TBP Plant supernatant was 329,000 gallons, with a total of 530,000 gallons of waste present in tank 241-T-107 (HW-30851, page 5). No waste was removed or added to tank 241-T-107 from February 1954 through September 1966, as indicated in Appendix A.

2.2.6 Evaporation of Scavenged TBP Supernatant (October 1966 to December 1966)

In 1965, the supernatant in tank 241-T-107 was sampled in preparation for processing in the 242-T Evaporator (LET-092465). The analyses of the tank 241-T-107 sample (Table 3) indicated that the concentration of cesium-137 was 7.7-µCi/mL, which was the only gamma emitting radionuclide detectable. The concentration of cesium-137 in the tank 241-T-107 supernatant sample is somewhat higher than the tank 241-T-101 scavenged TBP Plant waste (see Table 1). However, tank 241-T-107 contained a heel of 33,000 gallons of TBP Plant waste before the scavenged TBP Plant waste was added from tank 241-T-101. Therefore, the higher cesium-137 concentration is not unexpected.

Table 3. Composition of Tank 241-T-107 Supernatant – Scavenged TBP Plant Waste.

Analyte	Concentration (µCi/mL)	Units
Cesium-137	7.7E+03	µCi/L
CO_3	13.5	g/L
AlO_2	0.20	g/L
F	Not reported	g/L
Cl	10.5	g/L
Na	98	g/L
NO_3	203.5	g/L
CN	Not detected	
Free OH	0.164	N
Specific Gravity (g/mL)	1.204	g/mL
Volume Supernatant	330,000	Gallons
Volume Supernatant	330,000	Gallons

Boil-down studies with the tank 241-T-107 supernatant indicated solids did not form until more than 50 percent of the sample was evaporated. This indicates that the supernatant stored in tank 241-T-107 was not a saturated solution. Therefore, the mixture of scavenged and un-scavenged TBP Plant waste present in tank 241-T-107 likely did not form solids during storage. The volume of sludge measured in tank 241-T-107 in 1965 was reported as 186,000 gallons (RL-SEP-659, page 5), which is less than the 201,000 gallons of sludge measured in January 1954. Compaction of the sludge stored in tank 241-T-107 likely occurred during the 12-year period between measurements.

In the fourth quarter of calendar year 1966, approximately 311,000 gallons of supernatant were transferred from tank 241-T-107 to tank 241-TX-118 for processing in the 242-T Evaporator. The volume of supernatant and sludge remaining in tank 241-T-107 was reported as 22,000 gallons and 186,000 gallons, respectively (ISO-674, page 5). The 22,000 gallons of supernatant stored in tank 241-T-107 were a mixture of scavenged (90% volume) and unscavenged (10% volume) TBP Plant waste.

2.2.7 Coating Removal Waste (January 1967 to June 1967)

In January 1967, approximately 168,000 gallons of Plutonium-Uranium Extraction (PUREX) coating removal waste were transferred from tank 241-C-102 into tank 241-T107 (HAN-96590-DEL, page AIII-5 and ISO-806, page 5). Typical composition of PUREX Coating removal waste is provided in Table 4 (HW-52493 and HW-52824). An additional 129,000 gallons of PUREX coating removal waste were transferred from tank 241-C-102 into tank 241-T107 in the second quarter of calendar year 1967 (ISO-967, page 5).

The PUREX coating removal waste was mixed with the scavenged and unscavenged TBP Plant waste that was stored in tank 241-T-107. The quantities of PUREX coating removal waste, scavenged and un-scavenged TBP Plant waste stored in tank 241-T-107 were approximately

297,000 gallons, 20,000 gallons, and 2,000 gallons, respectively. The total volumes of supernatant and sludge stored in tank 241-T-107 were 319,000 gallons and 186,000 gallons (ISO-967, page 5).

Table 4. Typical Composition of PUREX Coating Removal Waste

Analyte	Concentration
Sodium (M)	3.7
Uranium (M)	0.002
Sodium Aluminate (M)	1.2
Nitrate (M)	0.6
Nitrite (M)	0.9
Hydroxide (M)	1.0
Silicate (M)	0.02
Pu (mg/liter)	0.2
Strontium-90 (μCi/L)	880
Cesium-137 (μCi/L)	840

2.2.8 Evaporation of Coating Removal Waste (October 1969 to December 1969)

In November 1969, approximately 275,000 gallons of supernatant were transferred from tank 241-T-107 to tank 241-TY-103, then to tank 241-TX-118 for processing in the 242-T Evaporator (PR-REPORT-NOV69-DEL, page AIV-4, and ARH-1200 D, page 7). The volume of supernatant and sludge remaining in tank 241-T-107 was reported as 119,000 gallons and 109,000 gallons, respectively (ARH-1200 D, page 7).

The volume of sludge reported to be in tank 241-T-107 in December 1969 is approximately 77,000 gallons less than the volume of sludge reported as present in December 1966 (ISO-674, page 5). It is possible that the PUREX coating removal waste that was transferred into tank 241-T-107 in January 1967 could have dissolved some of the aluminum present in the 1C/CW sludge and/or precipitated TBP Plant waste. PUREX coating removal waste typically contained 1.0M free hydroxide which could have dissolved aluminum present in the 1C/CW sludge. Tank 241-T-107 was inactive from December 1969 through December 1972.

2.2.9 B-Plant Cesium Ion Exchange Waste (January 1973 to June 1973)

In the first quarter of calendar year 1973, approximately 684,000-galons of waste from operation of the cesium ion exchange (IX) process and low-level waste evaporator in B-Plant was collected in tank 241-BX-104 and transferred to tank 241-T-107 (ARH-2974 A, page 6). The transfer pipeline was flushed with approximately 13,000 gallons of water that was also received into tank 241-T-107. The B-Plant IX waste was distributed to tanks 241-T-108 and 241-T-109.

Approximately 645,000 gallons of supernatant were transferred from tank 241-T-107 to tank 241-T-108. Approximately 378,000 gallons of supernatant were transferred from tank 241-T-108 to tank 241-T-109.

Tank 241-T-107 again received B-Plant cesium ion exchange waste from tank 241-BX-104 in the second quarter of calendar year 1973 (ARH-2974 B, page 6). Approximately 573,000 gallons of supernatant were received into tank 241-T-107. Approximately 2,000 gallons of supernatant were transferred from tank 241-T-107 to tank 241-T-108. An additional 452,000 gallons of supernatant were transferred from tank 241-T-107 to tank 241-T-105.

Tank 241-T-107 contained approximately 293,000 gallons of supernatant and 109,000 gallons of sludge following these transfers. The supernatant was mostly cesium ion exchange waste from B-Plant while the sludge was 1C/CW waste from the 221-T Bismuth Phosphate Plant. The supernatant in tank 241-T-107 was sampled in September 1975 (MEM-102775) and again in 1989 (letter 12712-PCL89-144). The analytical results for both sampling events are presented in Table 5. Based on these supernatant sample results, it is likely that some aluminum and strontium precipitated from the supernatant between sampling events. No additional waste transfers involving tank 241-T-107 occurred until this tank was removed from service in January 1976.

Table 5. Composition of Tank 241-T-107 Supernatant – B-Plant IX Waste.

Analyte	1975 Supernatant Concentration (µCi/mL)	1989 Supernatant Concentration (µCi/mL)	Units
Cesium-137	3.91E+04	2.23E+04	µCi/L
Strontium-89,90	2.33E+03	3.31E+02	µCi/L
Al	5.32E-03	1.02E-03	M
Na	2.44	2.35	M
NO_2	0.651	0.583	M
NO_3	0.800	2.19	M
Pu	< 1.0E-05		g/L
Pu-239,240		1.2E+01	µCi/L
Am-241	Not reported	1.99E-02	µCi/L
Differential Thermal Analysis	No exotherm	Not reported	
SO_4	Not reported	0.170	M
PO_4	0.0251	0.0616	M
Cl	0.0128	0.0354	M
F	0.0135	0.0491	M
OH	0.08	0.025	M
CO_3	0.394	0.374	M
pH	12.3	11.1	
Specific Gravity (g/mL)	1.129	1.2	g/mL
Visual Observation of sample	Dark yellow, less than 1% solids	Not reported	

2.2.10 Saltwell Pumping Interim Stabilization (February 1976 to September 1995)

Tank 241-T-107 was removed from service in January 1976. Removal of liquid from tank 241-T-107 was conducted from February 19, 1976 through July 19, 1976 as part of the program to remove interstitial liquid (i.e., saltwell pumping) from the single-shell tanks (letter 60410-78-092 and DS-021976). A total of 233,600 gallons of liquid waste were reported as being pumped from tank 241-T-107 to tank 241-T-101 during this period. From August 1976 through December 1978, saltwell pumping of liquids from tank 241-T-107 was periodically attempted. However, the pump was reported as inoperable (DS-021976).

Additional stabilization of the waste in tank 241-T-107 was conducted from September 14, 1995 through April 3, 1996 (HNF-SD-RE-TI-178, pages 207 to 213). Approximately 11,000 gallons of liquid were pumped from tank 241-T-107 to the double-shell tank system, leaving 173,000 gallons of sludge in this tank. Tank 241-T-107 was declared having been Interim Stabilized on May 22, 1996.

2.2.11 Comparison with Other Reports

Waste transfers into and waste removals from tank 241-T-107 are summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132) for 1945 through 1980, *Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 West Area* (HNF-SD-WM-ER-351), *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311) and the Tank Waste Information Network (http://twins.pnl.gov:8001/twins.htm). The information cited in Sections 2.2.1 through 2.2.10 is in agreement with these previous reports. These previous reports accurately state the volume of waste transferred into and removed from tank 241-T-107, as well as the volume of solids and total waste stored. However, there is some ambiguity over the composition of the sludge remaining in tank 241-T-107.

The *Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 West Area* (HNF-SD-WM-ER-351) indicates that tank 241-T-107 contains only sludge originating from 1C/CW waste from the 221-T Bismuth Phosphate Plant. However, this is probably an over simplification given the different waste types that were transferred into tank 241-T-107. The Tank Interpretive Report for tank 241-T-107 (Tank Waste Information Network) assumes that the sludge is comprised of a mixture of 1C/CW solids, TBP Plant waste solids, and PUREX coating removal waste solids.

The Tank Interpretive Report for tank 241-T-107 assumes that the volumes of 1C/CW solids, TBP Plant waste solids, and PUREX coating removal waste solids are 148,000 gallons, 17,000 gallons, and 8,000 gallons, respectively. The rationale given in the Tank Interpretive Report for assigning the volumes to each waste type is the waste transfer records provided in LA-UR-97-311 and WHC-MR-0132. However, neither of these documents identifies a specific sludge volume associated with the TBP Plant waste or the PUREX coating removal waste received into tank 241-T-107. The Tank Interpretive Report also notes that "a clear demarcation between waste types could not be discerned from the segment sample results." Based on this information, the Tank Interpretive Report assigned volume to each of the sludge types in tank 241-T-107 seems arbitrary. The precise quantity of each type of solids present in the tank 241-T-107 waste can not be determined.

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997.*

It has been established in Section 2.0 that first decontamination cycle (1C) waste mixed with coating removal waste (CW) from the 221-T Bismuth Phosphate plant was transferred into tank 241-T-107. Tank 241-T-107 also received waste from the Tri-Butyl Phosphate (221-U) Plant, cesium ion exchange waste from B-Plant, and coating removal waste from the PUREX Plant. The following sections provide a discussion of these waste types.

3.1 221-B and 221-T BISMUTH PHOSPHATE PROCESS PLANT

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from irradiated nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion. The Bismuth Phosphate process was operated in B-Plant from April 1945 (HW-7-1649-DEL, page 21) through June 1952 (HW-25227-DEL, pages Ed-5 and Ed-6), after which the inventory of radioactive materials was removed from the facility from July 1952 through March 1953 (HW-27774). The Bismuth Phosphate process was operated in T-Plant from December 1944 (HAN-45800-DEL, page 4) through March 1956, after which the inventory of radioactive materials was removed from the facility from March 1956 (HW-42219-DEL, page ED-5) through September 1956 (HW-45707-DEL, page D-5). T-Plant was placed in layaway status in October 1956 (HW-46432-DEL, page D-5).

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste sometimes referred to as coating waste (CW) was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

The fuel element uranium cores (see item [2] in Figure 2) were then dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution, and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented its precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed with water to separate the acidic supernatant from the precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW). Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). Of the predominate radionuclides remaining in the waste, the laboratory tests indicate the percentage of cesium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively.

The plutonium bearing cake was then dissolved in nitric acid, and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products (e.g., cerium, niobium, ruthenium, and zirconium), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C waste) were transferred to the same single-shell tank that received the coating removal waste. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids from the first decontamination cycle were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28).

During operation of B-Plant, the 1C waste was combined with the coating removal waste and transferred to the same single-shell tank. This same practice was conducted in T-Plant from December 1944 through October 19, 1954. Beginning on October 20, 1954, nickel ferrocyanide scavenging of the 1C waste was conducted in T-Plant to precipitate cesium-137 and strontium-90 (HW-33585-DEL, page Ed-8 and HW-33184). The precipitated 1C waste slurry was transferred separate from the coating removal waste to single-shell tanks for settling of the precipitate and discharge of the scavenged (i.e., cesium and strontium depleted) supernatant to a crib.

Table 6 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the 221-B/T bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C/CW, and 2C that was stored in single-shell tanks are provided in Tables 7 and 8. These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Figure 2. Bismuth Phosphate Process Diagram.

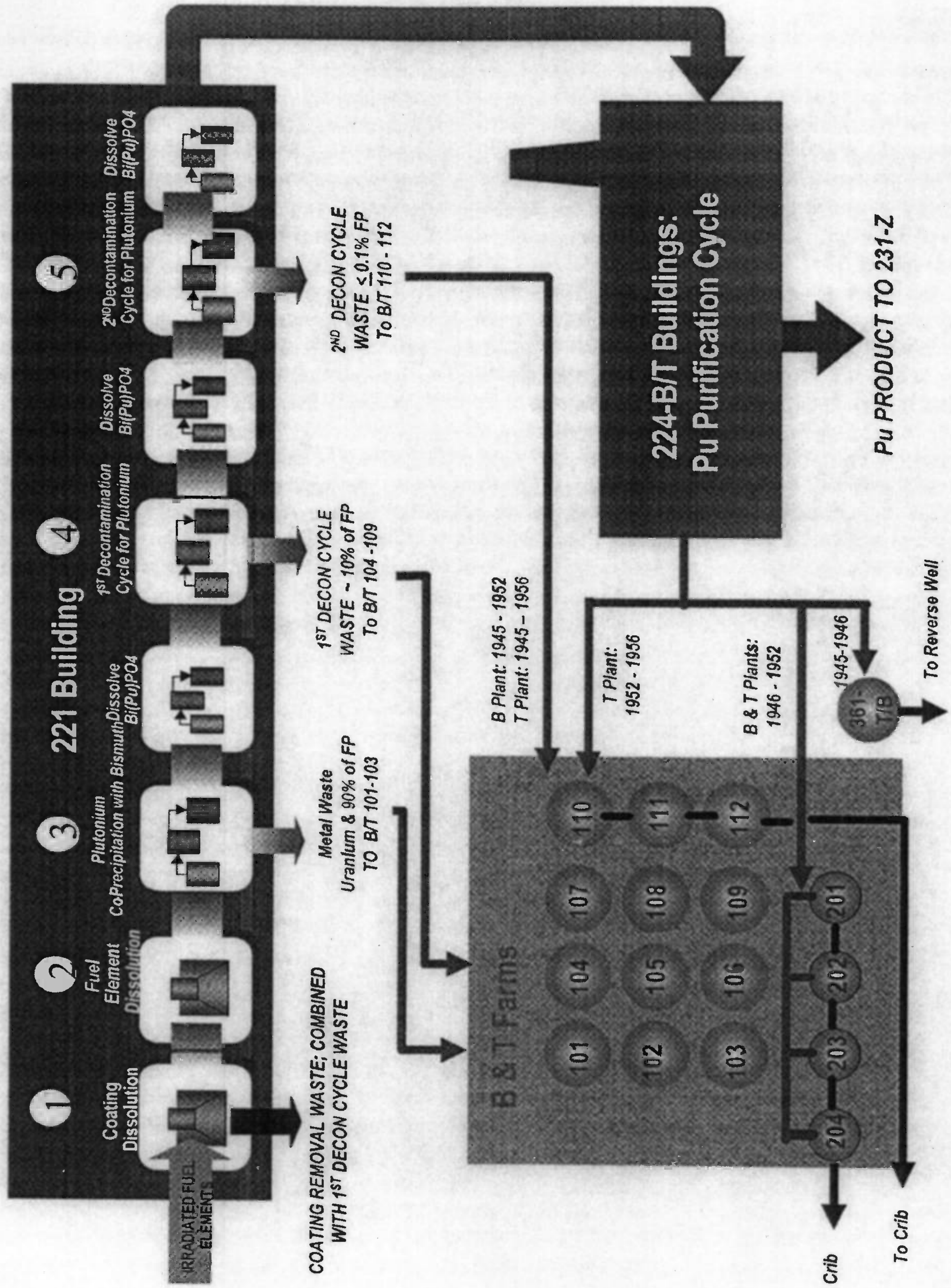


Table 6. Estimated Composition of Bismuth Phosphate Plant Wastes.
From October 1, 1951 Flowsheet [1]

Analyte [2]	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04[6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02[6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

(1) See HW-23043

(2) Analyses are reported in grams per liter, except for gamma activity, which is counts/minute/mL.

(3) HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.

(4) Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).

(5) Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).

(6) Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

Table 7. Analyses of Bismuth Phosphate Process Supernatants Stored.

Waste Type [1,2]	Tank	pH	Pu µg/L	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	10	35	110[5]	25[5]	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? [3]	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µg/L**	**Gross Beta Counts / minute/ cc.**	**Gross Gamma Counts / minute/ cc.**	**Date Sampled**
2C	T-110	Not reported [4]	15	4.9E+04	30	7-13-1945
2C	T-110	9.8[4]	19	6.9E+04	55	7-25-1945
2C	B-110	9.6[4]	8.5	7.0E+04	55	7-25-1945

Notes:

(1) See HW-10728 and HW-3-3220.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analysis for tank 241-B-112 seems to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 1C and 2C wastes were neutralized to a pH of approximately 10. The waste collected in tanks 241-B-110, 241-B-111, 241-B-112, 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Decrease in gross beta and gross gamma concentrations shown for the T-101 waste samples are due to decay of fission products with short half-lives.

Table 8. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant.

Tank	Date Filled	Pu µg/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y − Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.12	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.12	Not reported	0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.005	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.02**	**0.15**						

Notes:

[1] HW-36717, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, May 16, 1955, W. W. Schulz, General Electric Company, Richland, Washington.

[2] HW-20195, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, February 5, 1951, General Electric Company, Richland, Washington.

[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

3.1.1 221-T and 221-B Plant Cell Drainage Waste

During the operation of the 221-B and 221-T Bismuth Phosphate plants, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B and 221-T Plants contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High activity waste collected in 221-T Plant and 221-B Plant tanks 5-9 could be jetted to single-shell tank 241-T-107 and 241-B-107, respectively (HW-10475-C, page 918). Alternatively, the cell drainage waste could be transferred to process vessels with the 221-T (or 221-B) Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-Del, page 28). The T-Plant stack drainage waste was also collected as part of the cell drainage until May 28, 1951, after which the stack drainage was routed to the cascade of single-shell tank 241-TX-113, 241-TX-114, and 241-TX-115 (HW-21260-DEL, page 58).

Cell drainage waste collected in tank 5-6 was transferred to reverse well number 216-T-3 from January 1945 through August 1946. Crib number 216-T-6 was used to dispose of the cell drainage waste from August 1946 through June 1951. After June 1951, cell drainage waste was transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 (HW-55176, part V). The quantity and composition of the cell drainage solutions discharged from tank 5-6 varied (see HW-20583, page 4, and HW-33591, page 25).

3.1.2 221-T Equipment Decontamination Facility

In October 1958, plans were developed to convert the 221-T Plant for use as decontamination facility for equipment from the Reduction-Oxidation (REDOX) plant (HW-58051-DEL, page D-5). Work was conducted from February 1959 (HW-59434-DEL, page D-4) through June 1960 (HW-65935-DEL, page C-2) to convert the 221-T Plant. Equipment decontamination activities were initiated at the 221-T Plant in July 1960, with the receipt of a failed multipurpose dissolver from the REDOX plant (HW-66271-DEL, page C-2). Equipment decontamination waste was transferred to various cribs and single-shell tanks. Tank 241-T-107 did not receive equipment decontamination waste.

3.2 221-B PLANT FISSION PRODUCTS PROCESSING

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

3.2.1 STRONTIUM AND RARE EARTHS PROCESSING

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, pages B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144 and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, and cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.2.2 CESIUM AND STRONTIUM PROCESSING

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917). After separation of cesium, the alkaline supernatants were transferred directly to underground storage tanks. The ion exchange process used an ammonium carbonate / ammonium hydroxide solution to separate sodium from cesium on the ion exchange media. The aqueous wastes that contained ammonium were processed in the Cell 23 evaporator to concentrate these wastes and volatilize ammonia before transferred to underground storage tanks.

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PR-REPORT-SEP68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges. The PUREX high-level waste sludges were dissolved in nitric acid (known as PAS) in the 244-AR Vault and transferred to B-Plant for centrifugation to separate solids. The clarified solution was process in the solvent extraction equipment to separate strontium (PR-REPORT-SEP-68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until 1977. The aqueous waste from the solvent extraction process was evaporated in the Cell 23 evaporator and transferred to underground storage tanks.

3.3 PUREX PLANT

The PUREX plant was operated from 1956 through 1988 to reprocess irradiated nuclear fuels. The PUREX Plant processed both aluminum coated and zirconium clad irradiated nuclear fuels. For the aluminum-coated fuel, the fuel coating was dissolved in sodium hydroxide solution. The coating removal waste (designated as CW) was inherently alkaline and did not require neutralization before transfer to underground storage tanks. The zirconium clad fuel; Zircaloy®[1] (98.5 percent Zr and 1.5 percent Sn), was dissolved in a solution of ammonium fluoride and ammonium nitrate. The zirconium cladding waste was neutralized (designated as NCRW) by addition of sodium hydroxide solution before transfer to underground storage tanks (PFP-P-020-00001).

After dissolving the coating / cladding on the irradiated nuclear fuel, the uranium fuel elements were then dissolved. The dissolved fuel elements are then processed through a solvent extraction system that used tri-butyl phosphate solvent in a normal paraffin hydrocarbon diluent. The fission products and impurities separated during the uranium and plutonium solvent extraction process were neutralized and transferred underground storage tanks, forming supernatant and sludges within the tanks. The supernatant, known as PUREX supernatant neutralized (PSN) were stored separately in the 200 East Area tank farms and eventually processed in the B-Plant to remove cesium. The plutonium solutions generated at the PUREX Plant were transferred to the 234-5Z building (Z-Plant) for further processing. Uranium solutions were transferred to the

[1] Zircaloy® is a trademark of Teledyne Wah Chang, Albany, Oregon.

224-U building (UO_3 Plant) for conversion to an oxide and transfer to offsite facilities for re-use in the fabrication of nuclear fuel.

3.4 TRI-BUTYL PHOSPHATE (TBP) PLANT

The 221-U Plant was originally constructed and contained equipment for conducting the Bismuth Phosphate process, similar to 221-B and 221-T Plants. However, the Bismuth Phosphate process was never conducted in the 221-U Plant. Instead, the equipment in the 221-U Plant was replaced with a solvent extraction process to separate uranium from stored bismuth phosphate metal waste. The uranium solvent extraction process used tri-butyl phosphate (TBP) as the solvent dissolved in a hydrocarbon diluent. The so-called Tri-Butyl Phosphate Plant derived its name from the solvent used to separate uranium from the metal waste.

Processing of metal waste solutions in the TBP Plant was conducted from November 1952 (HW-26376-DEL, page Ed-3) through March 1957 (HW-51240). In the TBP Plant, there were two parallel processing lines (Line A and Line B) with identical equipment. The following discussion is applicable to either processing line.

Metal waste stored in the single-shell tanks consisted of precipitated sludge and supernatant. Both the supernatant and sludge contained uranium. The metal waste supernatant was first removed from a cascade of the single-shell tanks and collected in a separate single-shell tank. Metal waste sludge was then sluiced from a single-shell tank using the metal waste supernatant that was previously collected. The metal waste slurry was accumulated in several stainless steel tanks contained in an underground concrete vault. The metal waste sludge was allowed to settle in the stainless steel tank and the supernatant removed for re-use in sluicing sludge. The metal waste sludge was then dissolved in nitric acid and combined with metal waste supernatant. The nitric acidic concentration of the metal waste was adjusted to ensure the waste was stabile and did not form precipitates (HW-19140, pages 216 - 219).

The acidic metal waste solution was then transferred to the TBP Plant. In the TBP Plant, the acidic metal waste was evaporated to remove excess liquid and centrifuged to remove solids (HW-19140, pages 311 - 312). The clarified acidic solution was transferred to the RA pulse-column that contained tri-butyl phosphate solvent in a hydrocarbon diluent.

In the RA column, uranium was extracted from the acidic solution into the organic solvent phase. A dilute nitric acid scrub solution was introduced into the RA column to remove trace amount of cesium and strontium fission products that were co-extracted with the uranium. Cerium, ruthenium, niobium, and zirconium fission products are co-extracted with the uranium. The scrub solution also contained ferrous ammonium sulfate to reduce plutonium to the III valence state and prevent extraction along with the uranium into the organic solvent phase. Therefore, plutonium and cesium and strontium fission products remained in the aqueous phase along with approximately 0.5 percent of the uranium present in the feed to the column (HW-19140, pages 405 - 420). The aqueous waste leaving the RA column was known as the RAW stream.

The organic solvent phase containing the uranium and co-extracted fission products (cerium, ruthenium, niobium, and zirconium) was transferred to the RC pulse-column where uranium along with co-extracted plutonium and fission products were stripped from the solvent using 0.01 M nitric acid (HW-19140, pages 421 – 423). The 0.01 M nitric acid strip solution containing the recovery uranium was transferred to the 224-U Building (UO3 Plant) for further processing. In the UO_3 Plant, the uranium nitrate solution was evaporated to reduce the solution volume, calcined, and packaged for transportation off-site.

The organic solvent from the RC column was transferred to the RO pulse-column for removal of organic degradation products. The organic solvent was contacted with 0.4 M sodium sulfate to remove organic degradation products (HW-19140, pages 1111 – 1112). The aqueous waste solution from the RO column (designated as ROW stream) was combined with the RAW stream for treatment.

The combined RAW and ROW waste solutions were neutralized using sodium hydroxide solution to a pH greater than 9.5 (HW-19140, page 1206). Neutralization of the combined RAW and ROW waste resulted in the formation of sodium salts (e.g., sodium nitrate, sodium sulfate, and sodium phosphate). The neutralized RAW / ROW waste was then concentrated to minimize the volume of waste. Ammonia was evolved from the neutralized waste during the concentration step. The concentrated TBP Plant waste was then transferred to the single-shell tanks for storage (HW-19140, pages 1206 - 1209).

Beginning on September 29, 1954, the TBP Plant RAW / ROW waste was treated to precipitate cesium-137 and strontium-90 (HAN-62359-DEL, monthly report for September 1954, page 44). Cesium-137 and strontium-90 were precipitated by adding potassium ferrocyanide, sodium hydroxide, and nickel sulfate to the acidic TBP Plant waste (HW-30399 and HW-31731). The scavenged TBP Plant (RAW / ROW) waste was not concentrated. The scavenged TBP Plant waste was transferred to single-shell tanks where the nickel ferrocyanide ($Ni_2Fe(CN)_6$) precipitate was allowed to settle. The scavenged TBP Plant supernatant was then discharged cribs or trenches (HW-48518, pages 15 to 20).

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-T-107

The U.S. Department of Energy uses several factors to determine the disposition of radioactive wastes (DOE M 435.1). One of these factors is the concentration of alpha-emitting transuranic isotopes with half-life greater than 20 years present in the radioactive waste. Table 9 provides the best-basis inventory for transuranic elements (i.e., Np-237, Pu-238, Pu-239, Pu-240, and Am-241) contained in the tank 241-T-107 sludge, as reported on April 21, 2003 from the Tank Waste Information Network (TWINS) database; http://twins.pnl.gov:8001/twins.htm. The concentration of transuranic elements in the waste stored in tank 241-T-107 is approximately 154.5 ηCi/g.

The concentrations of cesium-137 and strontium-90 present in the waste stored in tank 241-T-107 are also provided in Table 9. The cesium-137 and strontium-90 concentrations are approximately 15.8 µCi/g and 108.4 µCi/g, which is consistent with tank 241-T-107 having received cesium ion exchange waste from B-Plant along with the 1C/CW sludge. The cesium-137 present in the tank 241-T-107 sludge is highly soluble. Testing conducted with a composite core sample of this sludge indicates approximately 24 percent of the cesium can be removed from the tank 241-T-107 sludge by washing with 0.01 M sodium hydroxide solution, and an additional 60 percent of the cesium-137 can be removed by leaching the sludge at 100 °C with 3.2 M sodium hydroxide solution. Approximately 80 percent of the technetium present in the tank 241-T-107 sludge can also be removed by washing the sludge with 0.01 M sodium hydroxide solution. Less than 1 percent of the transuranic and strontium-90 were removed during the washing and leaching tests with the tank 241-T-107 sludge (LA-UR-95-2070).

The inventories of transuranic elements, cesium-137, and strontium-90 present in tank 241-T-107 are also compared to the inventory of these radionuclides present in all 177 underground storage tanks at the Hanford Site in Table 9. The inventory of transuranic elements present in tank 241-T-107 is approximately 0.07 percent of the total inventory of transuranic elements present in all 177 underground storage tanks at the Hanford Site. The inventories of cesium-137 and strontium-90 present in tank 241-T-107 are approximately 0.03 percent and 0.22 percent of the total inventory of cesium-137, and strontium-90 present in all 177 underground storage tanks at the Hanford Site.

Table 9. Transuranic Elements and Fission Products in Tank 241-T-107.

Tank	TRU		Cs-137		Sr-90	
	ηCi/g	Ci	µCi/g	Ci	µCi/g	Ci
241-T-107	154.5	157.9	15.8	16,100	108.4	111,000
All 177 Tanks	Not applicable	226,511	Not applicable	46,080,000	Not applicable	50,280,000
241-T-107 waste as a percentage of all 177 tanks		0.07%		0.03%		0.22%

5.0 SUMMARY

The waste types received in tank 241-T-107 and their disposition are summarized in Table 10. Based on the waste transfer history, the sludge stored in tank 241-T-107 is comprised of 1C/CW sludge from the 221-T Bismuth Phosphate Plant that contains interstitial liquids. The interstitial liquids present in the 1C/CW sludge are from the cesium ion exchange process conducted in B-Plant. The concentration of transuranic elements present in the sludge stored in tank 241-T-107 is approximately 154.5 ηCi/g, which is consistent with the characteristics of 1C/CW sludge. The concentrations of cesium-137 and strontium-90 in the sludge contained in tank 241-T-107 are approximately 15.8 µCi/g and 108.4 µCi/g.

Table 10. Waste Transfer History for Tank 241-T-107.

Date	Waste Type	Source	Disposition	Waste Volume in Tank 241-T-107	
				Supernatant (gallons)	Sludge (gallons)
02/1945 to 03/1946	1C/CW	221-T Plant	Received 1,590,000 gallons of 1C/CW waste that cascaded into tanks 241-T-108 and 241-T-109. 1C/CW precipitated during storage.	530,000 total	
03/1951 to 07/1951	1C/CW Supernatant		Transferred 285,000 gallons of supernatant to 242-T Evaporator for concentration and storage.	245,000 total	
11/1952 to 01/1953	TBP Plant Waste	221-U Plant	Received 291,000 gallons of TBP Plant waste into tank 241-T-107 that cascaded to tank 241-T-108 and 241-T-109.	335,000	201,000
08/1953	TBP Plant Waste Supernatant		Transferred 302,000 gallons of supernatant to 242-T Evaporator for concentration and storage.	33,000	201,000
12/1954 to 01/1955	Scavenged TBP Plant Supernatant	Tank 241-T-101	Received 242,000 gallons of scavenged TBP Plant supernatant and 54,000 gallons of flush water.	329,000	201,000
10/1966 to 12/1966	Scavenged TBP Plant Supernatant		Transferred 311,000 gallons of supernatant to 242-T Evaporator for concentration and storage.	22,000	186,000
01/1967 to 06/1967	PUREX Coating Removal Waste	Tank 241-C-102	Received 297,000 gallons of PUREX coating removal waste.	319,000	186,000
10/1969 to 12/1969	PUREX Coating Removal Waste		Transferred 275,000 gallons of supernatant to 242-T Evaporator for concentration and storage.	119,000	109,000
01/1973 to 06/1973	Cesium Ion Exchange Waste	221-B Plant	Received 1,257,000 gallons of B-Plant cesium ion exchange process waste and 13,000 gallons of flush water from tank 241-BX-104. Transferred 269,000 gallons to tanks 241-T-108, 378,000 gallons to 241-T-109 and 452,000 gallons to 241-T-105.	293,000	109,000
02/1976 to 09/1995	Supernatant and Interstitial Liquids		Saltwell pumped tank as part of interim stabilization program.	0	173,000

6.0 REFERENCES

12712-PLC89-144, 1989, "Interim Results of Tank T-101 and T-107 Analysis and T-101 / Neutralized Plutonium Finishing Plant Acid Waste," (internal letter from D. R. Bratzel to A. J. DiLiberto, August 1), Westinghouse Hanford Company, Richland, Washington.

60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey, May 17), Rockwell Hanford Operations, Richland, Washington.

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-917, 1977, *Evaluation of Phosphotungstic Acid Process for Removal of Cesium-137 from PUREX Current Acid Waste*, Atlantic Richfield Hanford Company, Richland, Washington.

DOE M 435.1-1, 1999, *Radioactive Waste Management Manual*, July 9, 1999, U.S. Department of Energy, Washington, D.C.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doe/culres/mpd/toc.htm, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DS-021976, 1978, *Data Sheets Salt Well Transfer Tank T107 to T101 [02/19/1976 through 12/28/1978]*, Accession number D196234801.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944 through December 1946*, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-62359-DEL, 1955, *200 Area Monthly Reports for 1954*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-63671-DEL, 1951, *200 Area Monthly Reports for January 1, 1951 to December 31, 1951*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-90907, 1965, *Monthly Status and Progress Report for February 1965*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95105-DEL, 1966, *Monthly Status and Progress Report for June 1966*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95284-DEL, 1966, *Monthly Status and Progress Report for July 1966*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96590-DEL, 1967, *Monthly Status and Progress Report for Januar1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96805-DEL, 1967, *Monthly Status and Progress Report for February 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97066-DEL, 1967, *Monthly Status and Progress Report for March 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-98918-DEL, 1967, *Monthly Status and Progress Report for October 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99396-DEL, 1967, *Monthly Status and Progress Report for December 1967*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99604-DEL, 1968, *Monthly Status and Progress Report for January 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100127-DEL, 1968, *Monthly Status and Progress Report for March 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100357-DEL, 1968, *Monthly Status and Progress Report for April 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

HNF-SD-WM-ER-351, 1997, *Historical Tank Waste Content Estimate for the Northwest Quadrant of the Hanford 200 West Area*, Rev. 1, Fluor Daniel Northwest Inc., Richland, Washington.

HNF-SD-RE-TI-178, 2003, *Single-Shell Tank Leak Stabilization Record*, Rev. 8, CH2M HILL Hanford Group, Inc., Richland Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1338-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1945, *Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10728, 1948, "Process Waste Data – 200 Areas," (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.

HW-19140, 1951, *Uranium Recovery Technical Manual*, November 10, 1951, General Electric Company, Richland, Washington.

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.

HW-26376-DEL, 1952, *Hanford Works Monthly Report for November 1952*, General Electric Company, Richland, Washington.

HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.

HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, January 1953*, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, August 31, 1953*, General Electric Company, Richland, Washington.

HW-29383, 1953, *Test Procedure to Evaluate Scavenging of TBP Plant Solvent Extraction Waste with Nickel Ferrocyanide*, General Electric Company, Richland, Washington.

HW-29814, 1953, *Scavenging and Cribbing of TBP Plant Wastes (Meeting 0830 October 29, 1953)*, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, *October 31, 1953,* General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, *November 30, 1953,* General Electric Company, Richland, Washington.

HW-30399, 1954, *TBP Plant Nickel Ferrocyanide Scavenging Flowsheet, January 1954*, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW-31428, 1954, *Evaluation of Nickel Ferrocyanide Scavenging of Uranium Recovery Plant Solvent Extraction Waste*, General Electric Company, Richland, Washington.

HW-31731, 1954, *TBP Waste Scavenging,* General Electric Company, Richland, Washington.

HW-33184, 1954, *BiPO4 Plant Nickel Ferrocyanide Scavenging Flowsheet for First Cycle Waste Containing No Coating Removal Waste*, General Electric Company, Richland, Washington.

HW-33585-DEL, 1954 *Hanford Atomic Products Operation Monthly Report for October 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

HW-36979 A, 1952, *Summary of Tank Farm Operation Start-Up to 0800 1-1-54*, General Electric Company, Richland, Washington.

HW-36979 B, 1954, *Summary of Tank Farm Operation from 0800 1-1-54 to 0800 12-30-54*, General Electric Company, Richland, Washington.

HW-42219-DEL, 1956, *Hanford Atomic Products Operation for March 1956*, General Electric Company, Richland, Washington.

HW-45165-RD, 1953, *Tank Farms and Waste Evaporator Weekly Summary, Process Unit, Period 0800 01/23/53 – 0800 12/31/53*, General Electric Company, Richland, Washington.

HW-45707-DEL, 1956, *Chemical Processing Department Monthly Report for September 1956*, General Electric Company, Richland, Washington.

HW-46432-DEL, 1956, *Chemical Processing Department Monthly Report for October 1956*, General Electric Company, Richland, Washington.

HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through December 1956*, General Electric Company, Richland, Washington.

HW-51240, 1957, *Final Report – The Metal Waste Removal and Metal Recovery Layaway Operations in 200 West Area*, General Electric Company, Richland, Washington.

HW-52493, 1957, *Current Inventory of Hanford Wastes*, September 16, 1957, General Electric Company, Richland, Washington.

HW-52824, 1957, *Ultimate Disposal of PUREX Wastes*, September 26, 1957, General Electric Company, Richland, Washington.

HW-55176 – Pt. V, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.

HW-58051-DEL, 1958, *Chemical Processing Department Monthly Report for October 1958*, General Electric Company, Richland, Washington.

HW-59434-DEL, 1959, *Chemical Processing Department Monthly Report for February 1959*, General Electric Company, Richland, Washington.

HW-63051, 1961, *The Recovery of Fission Product Rare Earth Sulfates from PUREX IWW*, General Electric Company, Richland, Washington.

HW-65935-DEL, 1960, *Chemical Processing Department Monthly Report for June 1960*, General Electric Company, Richland, Washington.

HW-66271-DEL, 1960, *Chemical Processing Department Monthly Report for July 1960*, General Electric Company, Richland, Washington.

HW-69011, 1961, *Project CGC-897 – Title I Design Fission Product Storage in B Plant*, General Electric Company, Richland, Washington.

HW-69534, 1961 *Laboratory Development of a Carrier Precipitation Process for the Recovery of Strontium from PUREX Wastes*, General Electric Company, Richland, Washington.

HW-71187-DEL, 1961, *Chemical Processing Department Monthly Report for September 1961*, General Electric Company, Richland, Washington.

HW-76848-DEL, 1963, *Chemical Processing Department Monthly Report for February 1963*, General Electric Company, Richland, Washington.

HW-77016, 1963, *B-Plant Phase I Information Manual*, General Electric Company, Richland, Washington.

HW-78817-DEL, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Richland, Washington.

HW-81373, 1964, *Removal of Lead from B-Plant Cerium and Rare Earth Fractions*, General Electric Company, Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary October 1, 1966 – December 31, 1966,* Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary January 1, 1967 Through March 31, 1967,* ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary April 1, 1967 Through June 30, 1967,* ISOCHEM INC., Richland, Washington.

LA-UR-95-2070, 1995, *Sludge Washing and Alkaline Leaching Tests on Actual Hanford Tank Sludge: A Status Report*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LET-092465, 1965, "242-T Evaporator Feed," (internal letter from W. L. Godfrey to S. J. Beard, September 24), General Electric Company, Richland, Washington.

MEM-102775, 1975, "Analysis of Tank Farm Samples – Sample: T-8248 Tank: 107-T Received: September 25, 1975," (internal letter from R. E. Wheeler to R. L. Walser, November 26), Atlantic Richfield Hanford Company, Richland, Washington.

PFP-P-020-00001, 1982, *PUREX Flowsheet – Reprocessing N Reactor Fuels*, Rockwell Hanford Operations, Richland, Washington.

PR-REPORT-SEP68-DEL, 1968, *Monthly Status and Progress Report September 1968*, U.S. Atomic Energy Commission Richland Operations Office, Richland Washington.

PR-REPORT-NOV69-DEL, 1969, *Monthly Status and Progress Report November 1969*, U.S. Atomic Energy Commission Richland Operations Office, Richland, Washington.

RHO-RE-SA-169, 1986, *Sixteen Years of Cesium Recovery Processing at Hanford's B Plant*, Rockwell Hanford Operations, Richland, Washington.

RL-SEP-197, 1965, *Chemical Processing Department Monthly Report December 1964*, General Electric Company, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Hanford Atomic Products Operation, Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

APPENDIX A

VOLUME OF WASTE IN TANK 241-T-107

January 1945 through May 1977

This page intentionally left blank.

Table A-1. Volume of Wastes in Tank 241-T-107. (11 sheets)

Year	Month	Percentage filled[1]	Reference	Page	Comments
1945	January	Empty	HW-7-1293-DEL		No waste transferred into tank 241-T-107.
	February	6.33%	HW-7-1388-DEL	18	1C/CW waste from 221-T Plant collected in tank 241-T-107.
	March	7.9%	HW-7-1544-DEL	21	Same as above.
	April	10.0%	HW-7-1649-DEL	20	Same as above.
	May	16.6%	HW-7-1793-DEL	22	Same as above.
	June	18.1%	HW-7-1981-DEL	23	Same as above.
	July	22.6%	HW-7-2177-DEL	22	Same as above.
	August	31.8%	HW-7-2361-DEL	21	Same as above.
	September	38.3%	HW-7-2548-DEL	22	Same as above. 1C/CW waste began to overflow from tank 241-T-107 to tank 241-T-108 on September 1, 1945.
	October	49.2%	HW-7-2706-DEL	21	1C/CW waste being adjusted to pH 7 before discharge to cascade of tanks 241-T-107, 241-T-108, and 241-T-109.
	November	61.0%	HW-7-2957-DEL	21	Same as above.
	December	79.7%	HW-7-3171-DEL	21	Same as above. 1C/CW waste began to overflow from tank 241-T-108 to tank 241-T-109 on December 10, 1945.
					Same as above.
1946	January	86.5%	HW-7-3378-DEL	24	Same as above.
	February	95.5%	HW-7-3566-DEL	21	Same as above.
	March	100%	HW-7-3751-DEL	20 - 21	Tanks 241-T-107, 241-T-108, and 241-T-109 are filled with 1C/CW waste. 1C/CW waste from 221-T Plant diverted to tank 241-U-110 on March 11, 1946. However, transfer line developed a plug. 1C/CW waste was then diverted to tank 241-T-104.
	April	100%	HW-7-4004-DEL	20 - 21	1C/CW waste transfer line from 221-T Plant to 241-U Farm (tank 241-U-110) was unplugged. 1C/CW waste from 221-T Plant still being collected in tank 241-T-104.
	May	100%	HW-7-4193-DEL	21	Receiving 1C/CW waste from 221-T Plant into tank 241-T-104
	June	100%	HW-7-4343-DEL	23	Receiving 1C/CW waste from 221-T Plant into tank 241-T-104
	July	100%	HW-7-4542-DEL	21 - 22	Receiving 1C/CW waste from 221-T Plant into tank 241-T-104. Tank 241-T-104 filled and 1C/CW waste diverted to tank 241-U-110 on July 22, 1946.
	August	100%	HW-7-4739-DEL	23	Tank 241-T-107 filled with 1C/CW waste. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112.
	September	100%	HW-7-5194-DEL	26	Same as above.
	October	100%	HW-7-5362-DEL	28	Same as above.
	November	100%	HW-7-5505-DEL	28	Same as above.
	December	100%	HW-7-5630-DEL	25	Same as above.

Table A-1. Volume of Wastes in Tank 241-T-107. (11 sheets)

Year	Month	Percentage filled [1]	Reference	Page	Comments
1947	January	100%	HW-7-5802-DEL	26	Same as above.
	February	100%	HW-7-5944-DEL	25	Same as above.
	March	100%	HW-7-6048-DEL	23 - 24	Same as above. pH of 1C/CW waste supernatant being received in tank 241-U-110 measured to be between 9 and 10, slightly above target value of pH 7.
	April	100%	HW-7-6184-DEL	26	Same as above. Reduced the amount of caustic solution added t the 1C/CW waste in 221-T Plant to lower the pH to the target value of pH 7, which promotes precipitation of bismuth and plutonium.
	May	100%	HW-7-6391-DEL	23 – 24	Tank 241-T-107 filled with 1C/CW waste. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112.
	June	100%	HW-7-7454-DEL	26	Same as above.
	July	100%	HW-7283-DEL	26	Same as above.
	August	100%	HW-7504-DEL	27	Same as above.
	September	100%	HW-7795-DEL	27	Same as above.
	October	100%	HW-7997-DEL	27	Same as above.
	November	100%	HW-8267-DEL	29	Same as above.
	December	100%	HW-8438-DEL	27	Same as above.
1948	January	100%	HW-8931-DEL	28	Same as above.
	February	100%	HW-9191-DEL	29 - 30	Same as above.
	March	100%	HW-9595-DEL	32	Same as above.
	April	100%	HW-9922-DEL	31 - 32	Same as above.
	May	100%	HW-10166-DEL	33	Tank 241-T-107 filled with 1C/CW waste. 241-U-110, 241-U-111, and 241-U-112 are filled with 1C/CW waste. 1C/CW waste from 221-T Plant diverted to tank 241-T-105.
	June	100%	HW-10378-DEL	30	Same as above.
	July	100%	HW-10714-DEL	32 - 33	Same as above.
	August	100%	HW-10993-DEL	35 - 36	Tank 241-T-107 filled with 1C/CW waste. Tank 241-T-105 receiving 1C/CW waste from 221-T Plant.
	September	100%	HW-11226-DEL	33	1C/CW waste from 221-T Plant diverted to tank 241-T-105, which cascades to tank 241-T-106. Tank 241-T-107 filled with 1C/CW waste.
	October	100%	HW-11499-DEL	34	Same as above.
	November	100%	HW-11835-DEL	36	Same as above.
	December	100%	HW-12086-DEL	37	Same as above.

Table A-1. Volume of Wastes in Tank 241-T-107. (11 sheets)

Year	Month	Percentage filled [1]	Reference	Page	Comments
1949	January	100%	HW-12391-DEL	38 - 39	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 and 241-T-107, 241-T-108, and 241-T-109 are filled with 1C/CW waste from 221-T Plant. Jumper changes made in diversion boxes 241-TX-153, 241-TX-154, and 241-TX-155 to divert 1C/CW waste from 221-T Plant to cascade of tanks 241-TX-109, 241-TX-110, 241-TX-111, and 241-TX-112.
	February	100%	HW-12666-DEL	35	Cascade of tanks 241-T-107, 241-T-108, and 241-T-109 filled with 1C/CW waste from 221-T Plant.
	March	100%	HW-12937-DEL	40 – 41	Same as above.
	April	100%	HW-13190-DEL	40	Same as above.
	May	100%	HW-13561-DEL	42	Same as above.
	June	100%	HW-13793-DEL	41	Same as above.
	July	100%	HW-14043-DEL	43	Same as above.
	August	100%	HW-14338-DEL	44	Same as above.
	September	100%	HW-14596-DEL	43	Same as above.
	October	100%	HW-14916-DEL	43	Same as above.
	November	100%	HW-15267-DEL	45	Same as above.
	December	100%	HW-15550-DEL	43	Same as above.
1950	January	100%	HW-15843-DEL	45	Same as above.
	February	100%	HW-17056-DEL	45	Same as above.
	March	100%	HW-17410-DEL	49	Same as above.
	April	100%	HW-17660-DEL	47	Same as above.
	May	100%	HW-17971-DEL	45	Same as above.
	June	100%	HW-18221-DEL	45	Same as above.
	July	100%	HW-18473-DEL	46	Same as above.
	August	100%	HW-18740-DEL	50	Same as above.
	September	100%	HW-19021-DEL	49	Same as above.
	October	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-19325-DEL	50	Same as above.
	November	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-19622-DEL	49	Same as above.
	December	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-19842-DEL	51	Same as above.

Table A-1. Volume of Wastes in Tank 241-T-107. (11 sheets)

Year	Month	Percentage filled [1]	Reference	Page	Comments
1951	January	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-20161-DEL	50	Same as above.
	February	3,170,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-20438-DEL	50	Same as above.
	March	3,145,000 gallons of 1C/CW waste in tanks T-104 through T-109	HW-20671-DEL	54 - 56	Transferred about 25,000 gallons of 1C/CW waste from one of the T-Farm tanks to TX tank in preparation for evaporation in the 242-T Evaporator.
	April	1,585,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-20991-DEL	52 - 53	Transferred about 1,115,000 gallons of 1C/CW waste from tanks 241-T-104, 241-T-105, and 241-T-106 to tanks 241-TX-117 and 241-TX-118 in preparation for evaporation in the 242-T Evaporator. Tanks 241-T-104, 241-T-105, and 241-T-106 contained 470,000 gallons of sludge after removal of supernatant. Tanks 241-T-107, 241-T-108, and 241-T-109 remain filled with 1C/CW waste.
	May	1,300,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-21260-DEL	56 - 58	242-T Evaporator started up in later part of April 1951. A total of 189,046 gallons of 1C/CW waste processed through May 1948. A total of 1,379,000 gallons of 1C/CW waste transferred from 241-T Farm to 241-TX Farm as feed for 242-T Evaporator.
	June	875,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-21506-DEL	55 - 57	A total of 406,568 gallons of 1C/CW waste processed in June 1948 in the 242-T Evaporator. A total of 1,908,625 gallons of 1C/CW waste transferred from 241-T Farm to 241-TX Farm as feed for 242-T Evaporator.
	July	322,000 gallons of 1C/CW waste in tanks T-107 through T-109 470,000 gallons of sludge in tanks T-104 through T-106	HW-21802-DEL	41 - 42	A total of 539,083 gallons of 1C/CW waste processed in July 1948 in the 242-T Evaporator. A total of 2,296,125 gallons of 1C/CW waste transferred from 241-T Farm to 241-TX Farm as feed for 242-T Evaporator. This completes the processing of settled 1C/CW waste supernatant from 241-T Farm in the 242-T Evaporator.
	August	Not Reported	HW-22075-DEL		
	September	Not Reported	HW-22304-DEL		
	October	Not Reported	HW-22610-DEL		
	November	Not Reported	HW-22875-DEL		
	December	Not Reported	HW-23140-DEL		

Note: [1] Percentage of tanks 241-T-107, 241-T-108, and 241-T-109 filled with waste. Three tanks combined can retain nominally 1,590,000 gallons of waste.

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1952	January	Not Reported	Not Reported	HW-23437-DEL		
	February	Not Reported	Not Reported	HW-23698-DEL		
	March	Not Reported	Not Reported	HW-23982-DEL		
	April	245,000	Not Reported	HW-27838	10	
	May	245,000	Not Reported	HW-27838	21	
	June	245,000	Not Reported	HW-27838	32 - 33	Space reserved in tank 241-T-107 for waste from TBP Plant. Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 were filled on March 31, 1952 with 1C/CW from 221-T Pant. Cascade of tanks 241-TX-109, 241-TX-110, 241-TX-111, and 241-TX-112 receiving 1C/CW waste from 221-T Plant.
	July	245,000	Not Reported	HW-27839	10 - 11	Space reserved in tank 241-T-107 for waste from TBP Plant. Cascade of tanks 241-TX-109, 241-TX-110, 241-TX-111, and 241-TX-112 receiving 1C/CW waste from 221-T Plant.
	August	245,000	Not Reported	HW-27839	21 - 22	Same as above.
	September	245,000	Not Reported	HW-27839	32 - 33	Same as above.
	October	Not legible	Not Reported	HW-27840	10 - 11	Same as above.
	November	530,000	Not Reported	HW-27840	21	Started filling with TBP Plant waste on November 17, 1952. Filled tank 241-T-107 on November 26, 1952
	December	530,000	Not Reported	HW-27840	32	Tank 241-T-107 filled with 1C/CW sludge and TBP Plant waste. Tank 241-T-108 filled with TBP Plant waste on December 11, 1952. Started filling tank 241-T-109 with TBP Plant waste on December 12, 1952.
1953	January	536,000	201,000	HW-27841	10	
	February	335,000	201,000	HW-27842	10	
	March	335,000	201,000	HW-27775	10	
	April	335,000	201,000	HW-28043	5	

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1953	May	335,000	201,000	HW-28377	5	
	June	335,000	201,000	HW-28712	5	Started pumping TBP Plant waste from tank 241-T-109 to 241-TX-118 on June 30, 1953 for processing in the 242-T Evaporator (HW-28712, page 2).
	July	335,000	201,000	HW-29054	5	
	August	33,000	201,000	HW-29242	5	TBP Plant supernatant transferred from tanks 241-T-107, 241-T-108 and 241-T-109 to tank 241-TX-118 for processing in the 242-T Evaporator
	September	33,000	201,000	HW-29624	5	
	October	33,000	201,000	HW-29905	5	Tank 241-T-109 receiving concentrated 1C and TBP Plant waste from 242-T Evaporator via tank 241-TX-117.
	November	33,000	201,000	HW-30250	5	Tank 241-T-109 filled with concentrated 1C and TBP Plant waste from 242-T Evaporator via tank 241-TX-117.
	December	275,000	201,000	HW-30498	5	Tank 241-T-107 received scavenged TBP Plant supernatant from tank 241-T-101. See HW-29814 and HW-31428 for composition of supernatant transferred into tank 241-T-107.
1954	January	329,000	201,000	HW-30851	5	The ferrocyanide precipitate contained in tank 241-T-101 was flushed with water and the flush solution transferred to tank 241-T-107.
	February	329,000	201,000	HW-31126	5	Tank 241-T-108 receiving concentrated TBP Plant waste from 242-T Evaporator via tank 241-TX-117.
	March	323,000	201,000	HW-31374	5	Tank 241-T-108 filled with concentrated TBP Plant waste from 242-T Evaporator via tank 241-TX-117.
	April	323,000	201,000	HW-31811	5	
	May	323,000	201,000	HW-32110	5	
	June	323,000	201,000	HW-32389	5	
	July	323,000	201,000	HW-32697	5	
	August	323,000	201,000	HW-33002	5	
	September	323,000	201,000	HW-33396	5	
	October	323,000	201,000	HW-33544	5	
	November	323,000	201,000	HW-33904	5	
	December	323,000	201,000	HW-34412	5	
1955	January	323,000	201,000	HW-35022	5	
	February	323,000	201,000	HW-35628	5	
	March	323,000	201,000	HW-36001	5	
	April	323,000	201,000	HW-36553	5	

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1955	May	323,000	201,000	HW-37143	5	
	June	323,000	201,000	HW-38000	5	
	July	323,000	201,000	HW-38401	5	
	August	323,000	201,000	HW-38926	5	
	September	323,000	201,000	HW-39216	5	
	October	323,000	201,000	HW-39850	5	
	November	323,000	201,000	HW-40208	5	
	December	323,000	201,000	HW-40816	5	
1956	January	323,000	201,000	HW-41038	5	
	February	323,000	201,000	HW-41812	5	
	March	323,000	201,000	HW-42394	5	
	April	323,000	201,000	HW-42993	5	
	May	323,000	201,000	HW-43490	5	
	June	323,000	201,000	HW-43895	5	
	July	323,000	201,000	HW-44860	5	
	August	323,000	201,000	HW-45140	5	
	September	323,000	201,000	HW-45738	5	
	October	323,000	201,000	HW-46382	5	
	November	323,000	201,000	HW-47052	5	
	December	323,000	201,000	HW-47640	5	
1957	January	322,000	201,000	HW-48144	5	Latest electrode reading of waste level.
	February	322,000	201,000	HW-48846	5	
	March	322,000	201,000	HW-49523	5	
	April	301,000	201,000	HW-50127	5	Latest electrode reading of waste level.
	May	320,000	201,000	HW-50617	5	New electrode reading of waste level.
	June	320,000	201,000	HW-51348	5	New electrode reading of waste level.
	July	320,000	201,000	HW-51858	5	
	August	320,000	201,000	HW-52414	5	
	September	320,000	201,000	HW-52932	5	
	October	320,000	201,000	HW-53573	5	
	November	320,000	201,000	HW-54067	5	
	December	320,000	201,000	HW-54519	5	
1958	January	320,000	201,000	HW-54916	5	
	February	320,000	201,000	HW-55264	5	
	March	320,000	201,000	HW-55630	5	

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1958	April	320,000	201,000	HW-55997	5	
	May	320,000	201,000	HW-56357	5	
	June	320,000	201,000	HW-56761	5	
	July	320,000	201,000	HW-57122	5	
	August	320,000	201,000	HW-57550	5	
	September	320,000	201,000	HW-57711	5	
	October	320,000	201,000	HW-58201	5	
	November	320,000	201,000	HW-58579	5	
	December	320,000	201,000	HW-58831	5	
1959	January	320,000	201,000	HW-59204	5	
	February	320,000	201,000	HW-59586	5	
	March	318,000	201,000	HW-60065	5	
	April	318,000	201,000	HW-60419	5	
	May	318,000	201,000	HW-60738	5	
	June	318,000	201,000	HW-61095	5	
	July	318,000	201,000	HW-61582	5	
	August	318,000	201,000	HW-61952	5	
	September	318,000	201,000	HW-62421	5	
	October	318,000	201,000	HW-62723	5	
	November	318,000	201,000	HW-63083	5	
	December	318,000	201,000	HW-63559	5	
1960	January	318,000	201,000	HW-63896	5	
	February	318,000	201,000	HW-64373	5	
	March	318,000	201,000	HW-64810	5	
	April	318,000	201,000	HW-65272	5	
	May	318,000	201,000	HW-65643	5	
	June	318,000	201,000	HW-66187	5	
	July	318,000	201,000	HW-66557	5	
	August	318,000	201,000	HW-66827	5	
	September	318,000	201,000	HW-67696	5	
	October	318,000	201,000	HW-67705	5	
	November	318,000	201,000	HW-68291	5	
	December	318,000	201,000	HW-68292	5	
1961	January through June	318,000	201,000	HW-71610	5	
	July through December	318,000	201,000	HW-72625	5	

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1962	January through June	318,000	201,000	HW-74647	5	
	July through December	318,000	201,000	HW-76223	5	
1963	January through June	318,000	201,000	HW-78279	5	
	July through December	318,000	201,000	HW-80379	5	
1964	January through June	318,000	201,000	HW-83308	5	
	July through December	318,000	201,000	RL-SEP-260	5	
1965	January through June	341,000	186,000	RL-SEP-659	5	
	July through September	341,000	186,000	RL-SEP-821	5	
	October through December	341,000	186,000	RL-SEP-923	5	
1966	January through March	341,000	186,000	ISO-226	5	242-T Evaporator restarted on December 3, 1965 (ISO-226, page 9).
	April through June	333,000	186,000	ISO-404	5	Transferred 8,000 gallons of supernatant from tank 241-T-107 to tank 241-TX-118 for processing in the 242-T Evaporator.
	July through September	341,000	186,000	ISO-538	5	
	October through December	22,000	186,000	ISO-674	5	Transferred 311,000 gallons of supernatant from tank 241-T-107 to tank 241-TX-118 for processing in the 242-T Evaporator.
1967	January through March	190,000	186,000	ISO-806	5	Tank 241-T-107 received 168,000 gallons of PUREX Coating Removal waste from tank 241-C-102.
	April through June	319,000	186,000	ISO-967	5	Tank 241-T-107 received 129,000 gallons of PUREX Coating Removal waste from tank 241-C-102.
	July through September	319,000	186,000	ARH-95	6	
	October through December	319,000	186,000	ARH-326	6	
1968	January through March	318,000	186,000	ARH-534	6	
	April through June	317,000	186,000	ARH-721	6	
	July through September	317,000	186,000	ARH-871	6	
	October through December	317,000	186,000	ARH-1061	7	
1969	January through March	317,000	186,000	ARH-1200 A	7	
	April through June	317,000	186,000	ARH-1200 B	7	
	July through September	317,000	186,000	ARH-1200 C	7	
	October through December	119,000	109,000	ARH 1200 D	7	Transferred 275,000 gallons of waste from tank 241-T-107 to tank 241-TY-103, which was then transferred to tank 241-TX-118 for feed to the 242-T Evaporator.

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1970	January through March	119,000	109,000	ARH 1666 A	7	
	April through June	119,000	109,000	ARH 1666 B	7	
	July through September	119,000	109,000	ARH 1666 C	7	
	October through December	119,000	109,000	ARH 1666 D	7	
1971	January through March	119,000	109,000	ARH 2074 A	7	
	April through June	119,000	109,000	ARH 2074 B	7	
	July through September	120,000	109,000	ARH 2074 C	7	
	October through December	119,000	109,000	ARH 2074 D	7	
1972	January through March	118,000	109,000	ARH 2456 A	6	
	April through June	119,000	109,000	ARH 2456 B	6	
	July through September	119,000	109,000	ARH 2456 C	6	
	October through December	119,000	109,000	ARH 2456 D	6	
1973	January through March	173,000	109,000	ARH 2794 A	6	Tank 241-T-107 received 684,000 gallons of B-Plant cesium ion exchange process waste from tank 241-BX-104 and 13,000 gallons of water that was used to flush the transfer pipeline. Transferred 645,000 gallons of supernatant from tank 241-T-107 to tank 241-T-108. Transferred 378,000 gallons of supernatant from tank 241-T-108 to tank 241-T-109.
	April through June	293,000	109,000	ARH-2974 B	6	Tank 241-T-107 received 573,000 gallons of B-Plant cesium ion exchange process waste from tank 241-BX-104. Transferred 2,000 gallons of supernatant from tank 241-T-107 to tank 241-T-108. Transferred 452,000 gallons of supernatant from tank 241-T-107 to tank 241-T-105.
	July through September	290,000	109,000	ARH-2974 C	6	
	October through December	290,000	109,000	ARH-2974 D	6	

Table A-1. Volume of Waste in Tanks 241-T-107. (11 sheets)

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1974	January through March	290,000	109,000	ARH-CD-133 A	6	
	April through June	290,000	109,000	ARH-CD-133 B	6	
	July through September	291,000	109,000	ARH-CD-133 C	6	
	October through December	289,000	109,000	ARH-CD-133 D	6	
1975	January through March	289,000	109,000	ARH-CD-336 A	6	
	April through June	289,000	109,000	ARH-CD-336 B	6	
	July through September	289,000	109,000	ARH-CD-336 C	6	
	October through December	289,000	109,000	ARH-CD-336 D	6	
1976	January through March	261,000	109,000	ARH-CD-702 A	6	Tank 241-T-107 removed from service. Transferred 31,000 gallons of supernatant from tank 241-T-107 to tank 241-T-101.
	April through June	47,000	131,000	ARH-CD-702 B	6	Tank 241-T-107 removed from service. Transferred 189,000 gallons of supernatant from tank 241-T-107 to tank 241-T-101.
	September	47,000	131,000	ARH-CD-702 I	14	Saltwell pumping tank 241-T-107.
	October	47,000	131,000	ARH-CD-822-OCT	15	Saltwell pumping tank 241-T-107.
	November	47,000	131,000	ARH-CD-822-NOV	15	Saltwell pumping tank 241-T-107.
	December	47,000	131,000	ARH-CD-822-DEC	17	Saltwell pumping tank 241-T-107.
1977	January	47,000	131,000	ARH-CD-822-JAN	17	Saltwell pumping tank 241-T-107.
	February	0	131,000	ARH-CD-822-FEB	17	Saltwell pumping tank 241-T-107.
	March	0	131,000	ARH-CD-822-MAR	17	Saltwell pumping tank 241-T-107.
	April	0	131,000	ARH-CD-822-APR	17	Saltwell pumping tank 241-T-107.
	May	47,000	131,000	ARH-CD-822-MAY	17	Saltwell pumping tank 241-T-107.
1978	April	28,000	150,000	60410-78-092		A total of 233,600 gallons of interstitial liquid and supernatant were saltwell pumped from tank 241-T-107 to tank 241-T-101 from February 1976 through August 1977. Photograph taken on April 6, 1977 showed that the saltwell pump was in a large pool of liquid, estimated to be 25,000 gallons.

A1.0 REFERENCES

60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey, May 17), Rockwell Hanford Operations, Richland, Washington.

ARH-95, 1967, *Chemical Processing Division Waste Status Summary, July to September*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary April 1, 1968 through June 30, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary July 1, 1968 through September 30, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary October 1, 1968 through December 31, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 A, 1969, *Chemical Processing Division Waste Status Summary January 1, 1969 through March 31, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary April 1, 1969 through June 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary July 1, 1973 through September 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 A, 1976, *Production and Waste Management Division Waste Status Summary January 1, 1976 through March 31, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 B, 1976, *Production and Waste Management Division Waste Status Summary April 1, 1976 through June 30, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 I, 1976, *Production and Waste Management Division Waste Status Summary September 30, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-OCT, 1976, *Production and Waste Management Division Waste Status Summary October 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-NOV, 1976, *Production and Waste Management Division Waste Status Summary November 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-DEC, 1976, *Production and Waste Management Division Waste Status Summary December 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-JAN, 1977, *Production and Waste Management Division Waste Status Summary January 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-FEB, 1977, *Production and Waste Management Division Waste Status Summary February 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAR, 1977, *Production and Waste Management Division Waste Status Summary March 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-APR, 1977, *Production and Waste Management Division Waste Status Summary April 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAY, 1977, *Production and Waste Management Division Waste Status Summary May 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1946, *Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.

HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.

HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.

HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.

HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, General Electric Company, Richland, Washington.

HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.

HW-1550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.

HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.

HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-23437-DEL, 1952, *Hanford Works Monthly Report for January 1952*, General Electric Company, Richland, Washington.

HW-23698-DEL, 1952, *Hanford Works Monthly Report for February 1952*, General Electric Company, Richland, Washington.

HW-23982-DEL, 1952, *Hanford Works Monthly Report for March 1952*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*, General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, May 31, 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations – Operations, June 30, 1953*, General Electric Company, Richland, Washington.

HW-29054, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, July 31, 1953*, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, August 31, 1953*, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, September 30, 1953*, General Electric Company, Richland, Washington.

HW-29814, 1953, *Discussion Meeting Minutes Scavenging and Cribbing of TBP Plant Wastes (Meeting 0830 October 20, 1953), October 30, 1953*, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, October 31, 1953*, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW-31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, February 1954*, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

HW-31428, 1954, *Evaluation of Nickel Ferrocyanide Scavenging of Uranium Recovery Plant Solvent Extraction Waste*, General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, April 30, 1954*, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington

HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.

HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations – Engineering and Control, July 31, 1954*, General Electric Company, Richland, Washington.

HW-33002, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Projects and Personnel Development Sub-section, August 31, 1954*, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, September 31, 1954*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, November 30, 1954*, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, December 31, 1954*, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1955*, General Electric Company, Richland, Washington.

HW-35628, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1955*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 1955*, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1955*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1955*, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1955*, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, September 30, 1955*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, October 1955*, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, November 30, 1955*, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, December 31, 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1956*, General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1956*, General Electric Company, Richland, Washington.

HW-42394, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1956*, General Electric Company, Richland, Washington.

HW-42993, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1956*, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 31, 1956,* General Electric Company, Richland, Washington.

HW-43895, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1956,* General Electric Company, Richland, Washington.

HW-44860, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1956,* General Electric Company, Richland, Washington.

HW-45140, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1956,* General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department, Production Operation – Chemical Processing Department, September 30, 1956,* General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, October 1956,* General Electric Company, Richland, Washington.

HW-47052, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling Production Operation, November 30, 1956,* General Electric Company, Richland, Washington.

HW-47640, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, December 31, 1956,* General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, January 31, 1957,* Hanford Atomic Products, Richland, Washington.

HW-48846, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, February 1957,* Hanford Atomic Products Operation, Richland, Washington.

HW-49523, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, March 31, 1957,* Hanford Atomic Products Operation, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, April 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50617, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, May 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51348, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, June 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54067, 1957, *Waste- Status Summary; Chemical Processing Department, November 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54519, 1957, *Waste- Status Summary; Chemical Processing Department, December 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54916, 1958, *Waste- Status Summary; Chemical Processing Department, January 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55264, 1958, *Waste- Status Summary; Chemical Processing Department, February 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55630, 1958, *Waste- Status Summary; Chemical Processing Department, March 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55997, 1958, *Waste- Status Summary; Chemical Processing Department, April 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56357, 1958, *Waste- Status Summary; Chemical Processing Department, May 31, 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-56761, 1958, *Waste- Status Summary; Chemical Processing Department, June 30, 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-57122, 1958, *Waste- Status Summary; Chemical Processing Department, July 31, 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-57550, 1958, *Waste- Status Summary; Chemical Processing Department, August 31, 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-57711, 1958, *Waste- Status Summary; Chemical Processing Department, September 30, 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-58201, 1958, *Waste- Status Summary; Chemical Processing Department, October 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-58579, 1958, *Waste- Status Summary; Chemical Processing Department, November 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-58831, 1959, *Waste- Status Summary; Chemical Processing Department, December 1958,* Hanford Atomic Products Operation, Richland, Washington.

HW-59204, 1959, *Waste- Status Summary; Chemical Processing Department, January 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-59586, 1959, *Waste- Status Summary; Chemical Processing Department, February 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-60065, 1959, *Waste- Status Summary; Chemical Processing Department, March 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-60419, 1959, *Waste- Status Summary; Chemical Processing Department, April 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-60738, 1959, *Waste- Status Summary; Chemical Processing Department, May 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-61095, 1959, *Waste- Status Summary; Chemical Processing Department, June 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-61582, 1959, *Waste- Status Summary; Chemical Processing Department, July 1959,* Hanford Atomic Products Operation, Richland, Washington.

HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department, August 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department, September 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department, October 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department, November 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department, December 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63896, 1960, *Chemical Processing Department – Waste Status Summary, January 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64373, 1960, *Chemical Processing Department – Waste Status Summary, February 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65272, 1960, *Chemical Processing Department – Waste Status Summary, April 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-66187, 1960*Chemical Processing Department – Waste Status Summary, June 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66557, 1960, *Chemical Processing Department – Waste Status Summary, July 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66827, 1960, *Chemical Processing Department – Waste Status Summary, August 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67696, 1960, *Chemical Processing Department – Waste Status Summary, September 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67705, 1960, *Chemical Processing Department – Waste Status Summary, October 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68291, 1961, *Chemical Processing Department – Waste Status Summary, November 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68292, 1961, *Chemical Processing Department – Waste Status Summary, December 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-71610, 1961, *Chemical Processing Department – Waste Status Summary, January - June 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, July – December 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January – June 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-78279, 1963, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January - June 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-83308, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January – June 1964*, Hanford Atomic Products Operation, Richland, Washington.

ISO-226, 1966, *Chemical Processing Division – Waste Status Summary January 1, 1966 through March 31, 1966*, ISOCHEM INC., Richland, Washington.

ISO-404, 1966, *Chemical Processing Division – Waste Status Summary April 1, 1966 through June 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 through September 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary October 1, 1966 – December 31, 1966*, Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary January 1, 1967 Through March 31, 1967*, ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary April 1, 1967 Through June 30, 1967*, ISOCHEM INC., Richland, Washington.

RL-SEP-260, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1964 Through December 31, 1964*, Planning and Scheduling Production Operation, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Hanford Atomic Products Operation, Richland, Washington.

JAN 08 2004 (65)
STA115

ENGINEERING DATA TRANSMITTAL

1. EDT 820028

1A. Page 1 of 1

2. To: (Receiving Organization) Waste Disposal Strategic Planning	3. From: (Originating Organization) Process Analysis
5. Proj./Prog./Dept./Div.: Supplemental Treatment	6. Design Authority/Resp. Engr./Design Agent:

4. Related EDT No.: N/A

7. Purchase Order No.: N/A

9. Equip./Component No.: N/A

10. System/Bldg./Facility: N/A

12. Major Assembly Dwg. No.: N/A

13. Permit/Permit Application No.: N/A

14. Required Response Date: N/A

8. Originator Remarks:
This document describes the different types of waste that were transferred into and removed from single-shell tank 241-B-107

11. Receiver Remarks:

11A. Design Basis Document? ☐ Yes ☒ No

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
	RPP-17702		0	Origin of Waste in Single-Shell Tank 241-B-107	N/A	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
See TFC-ESHQ-Q-INSP-C-05	1. Approval 2. Review 3. Post-Review	1. Approved 2. Approved w/comment 3. Reviewed no comment 4. Reviewed w/comment 5. Disapproved

17. SIGNATURE/DISTRIBUTION

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Auth.				1	1	K. D. Boomer	K. D. Boomer	9/17/03	R1-44
1	1	Resp. Engr. M. E. Johnson	Michael Johnson	9/10/03	R1-44				~~Jim Hutt~~	~~1/8/04~~	~~JK 1/8/04~~
1	1	Resp. Mgr. S. M. Mackay	SMackay	10/2/03							
		QA									
		Safety									
		Env.									
		Design Agent									

18. Michael E Johnson 9/10/03
Signature of EDT Originator Date

19. DOE APPROVAL (if required)
Ctrl. No.

20. John Kott 1/5/04
Design Auth./Resp. Engr./Resp. Mgr. Date

BD-7400-172-2 (08/02)

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	M. E. Johnson	Date 09/10/03
Project Title/Work Order		EDT No. 820028
Origin of Waste in Single-Shell Tanks 241-B-107		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
CH2M HILL Hanford Group, Inc.					
K. D. Boomer	R1-44	x			
B. A. Higley	R1-44	x			
T. M. Horner	S5-13	x			
M. E. Johnson	R1-44	x			
N. W. Krich	R1-44	x			
J. G. Kristofzski	H6-03	x			
S. M. Mackay	R2-58	x			
D. E. Place	R1-44	x			
R. E. Raymond	H6-03	x			
A. R. Tedeschi	H6-03	x			
Central Files	B1-07	X			

RPP-17702, Rev. 0

Origin of Waste in Single-Shell Tank 241-B-107

Michael E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 820028 UC:
Cost Center: 7G400 Charge Code: 501546
B&R Code: Total Pages: 75

Key Words: Hanford, single-shell tank, B-107, 241-B-107, first decontamination cycle (1C) waste, coating waste (CW), tributyl phosphate plant, TBP waste

Abstract: Tank B-107 initially received 1C/CW waste from the 221-B BiPO4 Plant. The 1C/CW precipitated a sludge in this tank. The 1C/CW supernatant was processed in the 242-B Evaporator and eventually discharged to a specific activity retention trench. Next, TBP Plant supernatant was stored atop the 1C/CW sludge in tank B-107. The TBP Plant supernatant was transferred to tank C-101. The last waste type added to tank B-107 was PUREX CW, which also precipitated in this tank.

JAN 08 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

Nancy A. Fouad 1-8-04

Release Approval Date Release Stamp

Approved For Public Release

Rpp-17702
Revision 0

ORIGIN OF WASTE IN SINGLE-SHELL TANK 241-B-107

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
September 2003

CH2MHILL
Hanford Group, Inc.

Prepared for the U.S. Department of Energy
Office of River Protection

Contract #DE-AC27-99RL14047, Modification M030

Approved for Public Release; Further Dissemination Unlimited

This page intentionally left blank.

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tank 241-B-107. This review was conducted to support decisions concerning disposition of the waste present in this tank.

Tank 241-B-107 presently contains approximately 86,000 gallons of sludge and 75,000 gallons of saltcake. Based on the waste transfer history, the sludge stored in tank 241-B-107 is comprised of first decontamination cycle waste (1C) and coating removal waste (CW) and from operation of the 221-B Bismuth Phosphate Plant and coating removal waste from the Plutonium Uranium Extraction (PUREX) Plant. The saltcake waste present in tank 241-B-107 is from 221-B 1C/CW supernatant that had been concentrated in the 242-B Evaporator.

Radiochemical analysis of the sludge present in tank 241-B-107 was conducted in 1997; however, only the concentration of gross alpha emitting radionuclides was measured. The estimated concentration of transuranic elements in the tank 241-B-107 sludge is approximately 531.7 ηCi/g. The estimated concentrations of cesium-137 and strontium-90 in the sludge contained in tank 241-B-107 are approximately 28.4μCi/g and 222.4μCi/g.

CONTENTS

1.0 INTRODUCTION 7

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-B-107 7

2.1 DESCRIPTION OF TANK 241-B-107 7

2.2 WASTE TRANSFERS FOR TANK 241-B-107 9
2.2.1 1C/CW Waste (April 1945 – April 1946) 9
2.2.2 1C/CW Supernatant Evaporation (December 1951 – August 1953) 10
2.2.3 Trench Disposal of Concentrated 1C/CW Waste (August 1954) 11
2.2.4 Tri-Butyl Phosphate (TBP) Plant Waste (October 1954 – September 1957) 12
2.2.5 Scavenging TBP Plant Waste (September 1957) 13
2.2.6 Plutonium Uranium Extraction (PUREX) Coating Removal Waste (3rd Quarter 1963) 14
2.2.7 Evaporation of PUREX Coating Removal Waste (3rd Quarter 1969) 14
2.2.8 Saltwell Pumping Interim Stabilization 15
2.2.9 Comparison with Other Reports 15

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 16

3.1 221-B AND 221-T BISMUTH PHOSPHATE PROCESS PLANT 16
3.1.1 221-T and 221-B Plant Cell Drainage Waste 23

3.2 221-B PLANT FISSION PRODUCTS PROCESSING 24
3.2.1 Strontium and Rare Earths Processing 24
3.2.2 Cesium and Strontium Processing 25

3.3 PUREX PLANT 26

3.4 TRI-BUTYL PHOSPHATE (TBP) PLANT 27

3.5 242-B WASTE EVAPORATOR 29

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-B-107 30

5.0 SUMMARY 32

6.0 REFERENCES 33

APPENDIX

A. Volume of Wastes in Tanks 241-B-110, 241-B-111, and 241-B-112 .... A-1

FIGURES

Figure 1. Tank 241-B-107 Plan View 8

Figure 2. Bismuth Phosphate Process Diagram 19

TABLES

Table 1. Tanks Used to Store 221-B Plant 1C/CW Waste 9

Table 2. Composition of Tank 241-B-107 1C/CW Supernatant Discharged to Trench 12

Table 3. Composition of Concentrated TBP Plant Supernatant in Tank 241-B-107 13

Table 4. Typical Composition of PUREX Coating Removal Waste 14

Table 5. Estimated Composition of Bismuth Phosphate Plant Wastes...20

Table 6. Analyses of Bismuth Phosphate Process Supernatants Stored 21

Table 7. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant 22

Table 8. Transuranic Elements and Fission Products in Tank 241-B-107 31

Table 9. Waste Transfer History for Tank 241-B-107 32

LIST OF TERMS

1C	first cycle of the bismuth phosphate plutonium decontamination process
2C	second cycle of the bismuth phosphate plutonium decontamination process
5-6	low activity cell drainage waste
CAW	Current Acid Waste
cc	cubic centimeters
Ci	Curies
CW	Coating waste
DOE	U.S. Department of Energy
ITS	In-Tank Solidification
kgal	kilogallons
kL	kiloliters
$\underline{M}$	molarity or moles per liter
mg/L	milligrams per liter
MW	Metal waste
PAS	PUREX Acidified Sludge
PUREX	Plutonium Uranium Extraction Plant
TBP	Tri-Butyl Phosphate
ηCi/g	nanocuries per gram
μCi/cc	microcuries per cubic centimeters
μCi/g	microcuries per gram
μCi/L	microcuries per liter
μCi/mL	microcuries per milliliter
μg/cc	micrograms per cubic centimeters
μg/L	micrograms per liter

1.0 INTRODUCTION

The origin of the waste in tank 241-B-107 has been reviewed to provide information for determining the disposition of this waste. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tank 241-B-107. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to single-shell tank 241-B-107. Section 4.0 provides a discussion on the radionuclide analyses of the waste in single-shell tank 241-B-107. Section 5.0 summarizes the waste types that were transferred into single-shell tank 241-B-107.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-B-107

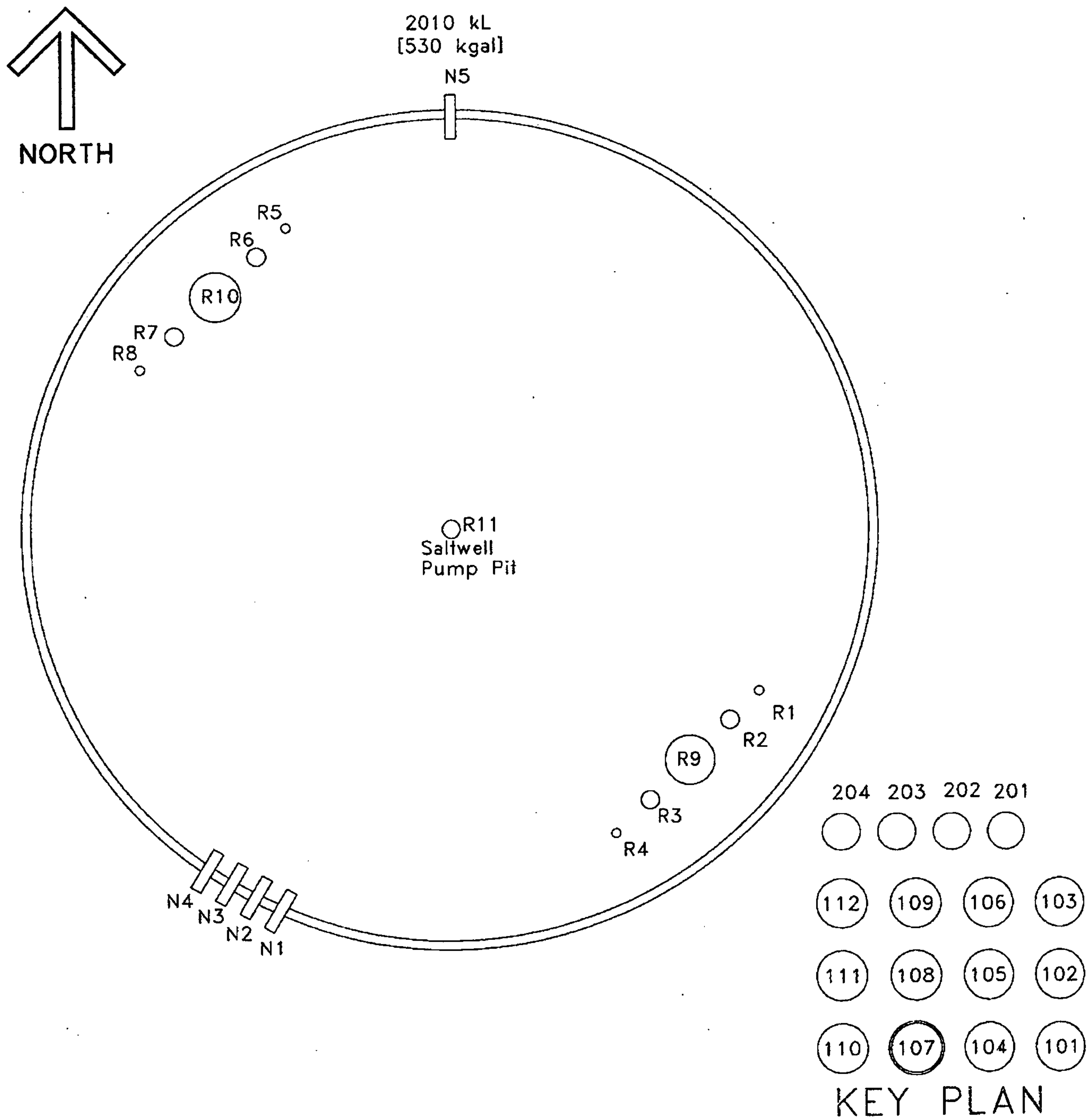
This section provides a brief description of single-shell tank 241-B-107 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the waste presently stored in single-shell tank 241-B-107, publicly available reports for the Hanford Site were reviewed. With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/, Central Files (509-376-5440), or the U.S. Department of Energy (DOE) Information Bridge at http://www.osti.gov/bridge/. The waste status summary reports are available only as photocopies from Hanford Site Central Files organization.

2.1 DESCRIPTION OF TANK 241-B-107

Single-shell tank 241-B-107 was originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX) and is one of the twelve, 100 series tanks in 241-B Tank Farm. Figure 1 provides a plan view of tank 241-B-107. The 100-series tanks are seventy-five-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. The steel liner extends to a height of nineteen foot. Each 100 series tank has a design capacity of 530,000 gallons at a liquid depth of sixteen feet and eight inches. The 241-B Tank Farm also includes four 200 series tanks that are of similar construction as the 100 series tanks, but are only twenty-foot diameter and each have a capacity of 55,000 gallons.

Single-shell tank 241-B-107 is equipment with five, 3-inch diameter stainless steel inlet pipes designated as N1 through N5 in Figure 1 (HW-10475-C, page 907 and 908). Inlet pipes N1 through N3 were connected to diversion box 241-B-153, which allowed waste to be transferred into tank 241-B-107 (H-2-44502, sheet 12). Inlet pipe N4 was a spare that was blanked off close to the tank when this tank was constructed in 1944. Inlet pipe N5 was connected via an underground overflow pipeline to allow waste to cascade to tank 241-B-108. Tank 241-B-108 was also connected via a separate underground overflow pipeline to tank 241-B-109, which allowed waste to cascade from tank 241-B-107 into tank 241-B-108 and then into tank 241-B-109. Alterations to the piping network have occurred over the years.

Figure 1. Tank 241-B-107 Plan View



2.2 WASTE TRANSFERS FOR TANK 241-B-107

Waste transfers into tank 241-B-107 and the operation of the tanks 241-B-107, 241-B-108, and 241-B-109 as a cascade are discussed in chronological order. A chronological listing is provided in Appendix A of waste transfers into and waste removal from tank 241-B-107 from 1945 through 1977. Section 3.0 describes the operation of the processing facilities that generated the waste types transferred into tank 241-B-107.

2.2.1 1C/CW Waste (April 1945 – April 1946)

Irradiated nuclear fuel was first processed in 221-B Plant beginning on April 13, 1945 (HW-7-1649-DEL, page 18). The first decontamination cycle (1C) waste was combined with the coating removal waste (CW) and transferred to the cascade of tanks 241-B-107, 241-B-108, and 241-B-109. The combined 1C/CW waste was reported as beginning to collect in tank 241-B-107 in May 1945 (HW-7-1793-DEL, page 22).

Tank 241-B-107 was reported as being filled in October 1945, with 1C/CW waste overflowing to tank 241-B-108 (HW-7-2706-DEL, page 21). Tank 241-B-108 was reported as being filled with 1C/CW waste in January 1946, with 1C/CW waste overflowing to tank 241-B-109 (HW-7-3378-DEL, page 24). Tanks 241-B-107, 241-B-108, and 241-B-109 continued to receive the combined 1C/CW waste until April 24, 1946, when these tanks were reported as being filled (HW-7-4004-DEL, page 20 and 21).

After filling tanks 241-B-107, 241-B-108, and 241-B-109, the 1C/CW waste generated at the 221-B Plant was transferred to other single-shell tanks for storage. Table 1 lists the single-shell tanks that received 1C/CW waste from operations conducted in the 221-B Bismuth Phosphate Plant. No other waste types were transferred into these tanks during this time frame.

Table 1. Tanks Used to Store 221-B Plant 1C/CW Waste

Cascade	Started Receiving Waste	Date Cascade Filled	Reference Document
241-B-107, 241-B-108, 241-B-109	April 1945	April 24, 1946	HW-7-1649-DEL, page 18 HW-7-4004-DEL, page 20
241-C-110, 241-C-111, 241-C-112	April 24, 1946	March 31, 1947	HW-7-6048-DEL, page 23-24 HAN-45801-DEL, page 60
241-C-107, 241-C-108, 241-C-109	April 2, 1947	September 14, 1948	HW-11226-DEL, page 32-33 HAN-45801-DEL, page 91
241-BX-107, 241-BX-108	September 14, 1948	September 1949	HW-14596-DEL, page 42
241-BX-110, 241-BX-111	September 1949	June 1950	HW-18221-DEL, page 44
241-B-104, 241-B-105	June 1950	September 1950	HW-19021-DEL, page 48-49
241-BX-107, 241-BX-108, 241-BX-109	September 1950	December 1950	HW-19842-DEL, page 51
241-BY-107, 241-BY-108, 241-BY-109	December 1950	August 1951	HW-22304-DEL, page 39
241-BX-110, 241-BX-111, 241-BX-112	August 1951	Date not reported	
241-BY-110	April 1952	November 1952	HW-27838, page 8 HW-27840, page 21

Prior to October 1945, the 1C/CW waste was neutralized to a pH of approximately 10 in 221-B Plant before transfer to the single-shell tanks (HW-3-3220, page 13). Beginning in October 1945, the pH of the 1C/CW waste was adjusted to approximately pH 7 in 221-B Plant before transfer to the single-shell tanks. This was done to cause the precipitation of bismuth and plutonium in the 1C/CW waste so that the supernatant would contain a lower concentration of plutonium (HW-7-2706-DEL, page 21). As a result, tank 241-B-107 contained settled 1C/CW solids (i.e., bismuth and plutonium precipitate) and 1C/CW supernatant.

2.2.2 1C/CW Supernatant Evaporation (December 1951 – August 1953)

The 1C/CW waste stored in tank 241-B-107 sat undisturbed from April 1946 through December 13, 1951.

Floating head suction pumps were installed in the single-shell tanks that contained 1C/CW waste (H-2-2076). The floating head suction pump allowed the 1C/CW supernatant to be transferred from these tanks, while leaving the 1C/CW sludge in the tank. Beginning on December 14, 1951, the 1C/CW supernatant contained in tanks 241-B-107, 241-B-108, and 241-B-109 was transferred to tank 241-B-106 for processing in the 242-B Evaporator, leaving a heel of approximately 220,000 gallons of 1C/CW sludge in tank 241-B-107. The 1C/CW supernatant was processed in the 242-B Evaporator to concentrate this waste. The concentrated 1C/CW supernatant was transferred to tank 241-B-108 for storage (HW-27838, page 9).

The 1C/CW supernatant contained in tanks 241-C-107, 241-C-108, 241-C-109, 241-C-110, 241-C-111, and 241-C-112 was transferred to tank 241-B-106 and then processed in the 242-B Evaporator from April 1952 (HW-27838, page 9) to August 1952 (HW-27839, page 20). The 1C/CW supernatant contained in tanks 241-B-104 and 241-B-105 and some of the 1C/CW supernatant in tank 241-BY-107 was transferred to tank 241-B-106 and then processed in the 242-B Evaporator from August 1952 (HW-27839, page 20) to September 1952 (HW-27839, page 32). The concentrated 1C/CW supernatant generated in the 242-B Evaporator was stored in tanks 241-B-105, 241-B-107, and 241-B-109. The cascade of tanks 241-B-107, 241-B-108, and 241-B-109 were reported as being filled with concentrated 1C/CW supernatant and 1C/CW sludge as of December 4, 1952 (HW-27840, page 31).

The remaining 1C/CW supernatant in tanks 241-BY-107, 241-BX-107, 241-BX-108, and 241-BX-109 were transferred to tank 241-B-106 and processed in the 242-B Evaporator in December 1952 and January 1953, with the concentrated 1C/CW supernatant stored in tanks 241-B-104 and 241-B-105 (HW-27840, pages 31-32 and HW-27841, pages 9-10). As of January 1953, the tanks available for storing concentrated 1C/CW supernatant, 241-B-104, 241-B-105, 241-B-107, 241-B-108, and 241-B-109, were filled with waste.

The concentrated 1C/CW supernatant contained in tanks 241-B-104, 241-B-105, 241-B-107, 241-B-108, and 241-B-109 was processed through the 242-B Evaporator from February 18, 1953 (HW-27842, page 9) through June 1953 (HW-28712, page 4) to gain further reduction of waste volume. The re-concentrated 1C/CW supernatant was transferred to tanks 241-B-107, 241-B-108, and 241-B-109, which were filled from February 1953 (HW-27842, page 9) through August 1953 (HW-29242, page 4).

From January through July 1953, tank 241-B-107 was reported to contain 220,000 gallons of 1C/CW sludge. However after receipt of the re-concentrated 1C/CW supernatant, tank 241-B-107 was reported to contain 172,000 gallons of 1C/CW sludge. From August 1953 through August 1954, the sludge volume in tank 241-B-107 was continued to be reported as 172,000 gallons (with 358,000 gallons of concentrated 1C/CW supernatant). There is no reason provided in the waste transfer records for the apparent 48,000 gallon decrease in the 1C/CW sludge volume. As discussed in section 2.2.3, the sludge volume measurements reported from August 1953 through August 1954 appear to have been in accurate. No waste transfers into or waste removal from tank 241-B-107 occurred from September 1953 through July 1954.

2.2.3 Trench Disposal of Concentrated 1C/CW Waste (August 1954)

On August 31, 1954, 320,375 gallons of concentrated 1C/CW supernatant stored in tank 241-B-107 were transferred to the 241-BXR-3 (later renumbered to 216-B-37) trench. The composition of the concentrated 1C/CW supernatant discharged from tank 241-B-107 to this trench is provided in Table 2 (HW-33591, page 11). After disposal of the concentrated 1C/CW supernatant, tank 241-B-107 was reported to contain approximately 225,000 gallons of 1C/CW sludge and no supernatant.

The sludge volume in tank 241-B-107, 225,000 gallons was consistent with the sludge volume reported for the period preceding the addition of the concentrated 1C/CW supernatant to this tank. Therefore, it is surmised that the sludge volume reported in tank 241-B-107 from August 1953 through August 1954, 172,000 gallons was inaccurate.

The 1C/CW supernatant contained in tanks 241-BX-110, 241-BX-111, 241-BX-112, 241-BY-106, 241-BY-110, 241-T-104, 241-T-105, 241-T-106, 241-TX-109, 241-TX-110, and 241-TX-111, and concentrated 1C/CW supernatant contained in tanks 241-B-107, 241-B-108, 241-B-109, 241-TY-101, and 241-TY-102 were also discharged to trenches from January 1954 through November 1954 (HW-33591, pages 11 and 12, and HW-38562, pages 10, 28 and 29). The disposal of 1C/CW supernatant to these trenches was based on the concept of retaining fission products, plutonium, and uranium in the soil column. Trench disposal of the 1C/CW supernatant was thought to be an economical method for providing additional capacity in the single-shell tanks for storage of wastes with higher radioactivity (HW-34281).

Table 2. Composition of Tank 241-B-107 1C/CW Supernatant Discharged to Trench

Analyte	Concentration (µCi/mL)	Curies
Plutonium (Pu)	2.38E-06	2.9E-03
Uranium (U)	9.8E-07	1.2E-03
Cesium (Cs)	0.82	994.4
Strontium (Sr)	7.4E-03	9.0
pH	8.0	
Volume (gallons)	320,375	

2.2.4 Tri-Butyl Phosphate (TBP) Plant Waste (October 1954 – September 1957)

Neutralized waste from the Tri-Butyl Phosphate (TBP) Plant was transferred into single-shell tanks in the 200 East Area that had previously contained 1C/CW waste. Tanks 241-C-107 through 241-C-112, 241-BX-107 through 241-BX-109, 241-BY-107, and 241-BY-108 all received TBP Plant waste from November 1952 (HW-27840) through October 1954 (HW-33544). TBP Plant waste was also stored in tanks 241-C-101, 241-C-102, 241-C-103, 241-C-105, and 241-C-106 that had previously contained metal waste. After September 29, 1954, the TBP Plant waste was treated in the TBP Plant to precipitate cesium-137 and strontium-90 and was not discharged to these tanks (see Section 3.4). Alkaline insoluble components in the TBP Plant waste such as iron and strontium-90 precipitated and settled in these tanks (HW-33536, page 3).

Beginning on September 20, 1953, the TBP supernatant stored in the 200 East Area single-shell tanks was transferred into tank 241-B-106 and processed through the 242-B Evaporator to reduce the waste volume (HW-29624, page 2). The 242-B Evaporator continued to be used to concentrate TBP Plant supernatant until November 1954, after which the evaporator was shut down (HW-33962-DEL, page Ed-6). Evaporation of the TBP Plant supernatant was no longer necessary. The TBP Plant supernatant and concentrated TBP Plant supernatant were treated in the 244-CR Vault to precipitate cesium-137 and residual strontium-90, thereby allowing the discharge of the treated supernatant to disposal trenches and cribs.

The concentrated TBP Plant supernatant generated in the 242-B Evaporator was stored in tanks 241-B-101 through 241-B-105, 241-B-107, 241-B-109 through 241-B-111, and 241-BX-110 through 241-BX-112. Tank 241-B-107 received 263,000 gallons of concentrated TBP Plant supernatant from tank 241-B-105 in October 1954 (HW-33544, page 4). An additional 182,00 gallons of concentrated TBP Plant supernatant was transferred in March 1955 from tank 241-B-105 into tank 241-B-107, with approximately 140,000 gallons of concentrated TBP Plant supernatant then cascading into tank 241-B-108 (HW-36001, page 4). As a result of these two transfers, tank 241-B-107 contained 305,000 gallons of TBP Plant supernatant. The composition of the concentrated TBP Plant supernatant stored in tank 241-B-107 is provided in Table 3 (WHC-MR-0089).

Tank 241-B-107 was reported to contain 225,000 gallons of 1C/CW sludge and 305,000 gallons of concentrated TBP Plant supernatant in March 1955 (HW-36001, page 4). The mixture of concentrated TBP Plant supernatant and 1C/CW sludge stored in tank 241-B-107 sat undisturbed until September 1957.

Table 3. Composition of Concentrated TBP Plant Supernatant in Tank 241-B-107

Analyte	Concentration (µCi/mL)	Curies
Cobalt-60	1.1E-03	1.27
Cesium-137	28.0	32,330
Strontium-90	0.14	164.7
pH	9.6	
Volume (gallons)	305,000	

2.2.5 Scavenging TBP Plant Waste (September 1957)

The approximately 264,000 gallons of concentrated TBP Plant supernatant stored in tank 241-B-107 was transferred to tank 241-C-101 in September 1957 (HW-52932, page 4). The concentrated TBP Plant supernatant was then transferred to the 244-CR Vault for treatment. The concentrated TBP Plant supernatant was adjusted to pH 6.9 ± 0.3 by addition of nitric acid, then reacted with nickel sulfate, sodium sulfide, sodium ferrocyanide, and calcium nitrate to remove cobalt-60, cesium-137, and strontium-90 as a nickel ferrocyanide precipitate, so-called scavenging process (HW-38955 and WHC-MR-0089). After precipitation of the radionuclides, the slurry was adjusted to pH 8.1 ± 0.3 by addition of sodium hydroxide.

The slurry of treated supernatant and nickel ferrocyanide precipitate was transferred to tanks 241-C-108, 241-C-109, 241-C-111, or 241-C-112 for settling. After settling of the nickel ferrocyanide precipitate, the supernatant was discharged to the 216-BC cribs and trenches (HW-44784, page 20, HW-48518, page 16 and 19, HW-53336, page 18, HW-55593, pages 15 and 18, and HW-57649, page 16).

Tank 241-B-107 was reported to contain 261,000 gallons of 1C/CW sludge and no supernatant in October 1957, following the removal of the concentrated TBP supernatant (HW-53573, page 4). No additional waste transfers into or waste removal from tank 241-B-107 occurred until the third quarter of calendar year 1963.

2.2.6 Plutonium Uranium Extraction (PUREX) Coating Removal Waste (3rd Quarter 1963)

In third quarter of calendar year 1963, approximately 264,000 gallons of Plutonium Uranium Extraction (PUREX) coating removal waste were transferred from tank 241-C-102 into tank 241-B-107 (HW-80379, page 4). Typical composition of PUREX Coating removal waste is provided in Table 4 (HW-52493 and HW-52824). Following this transfer, tank 241-B-107 contained 264,000 gallons of PUREX coating removal waste and 271,000 gallons of 1C/CW sludge.

No additional waste transfers into or waste removal from tank 241-B-107 occurred until the third quarter of calendar year 1969. However, the volume of supernatant and sludge present in tank 241-B-107 were measured in the first quarter of 1965 and determine to be 347,000 gallons and 202,000 gallons, respectively (RL-SEP-659). The PUREX coating removal waste typically contained 1 M free hydroxide. The decrease in sludge volume in tank 241-B-107 may have been due to dissolution of aluminum in the 1C/CW sludge, sludge settling, or correction of prior erroneous measurements.

Table 4. Typical Composition of PUREX Coating Removal Waste

Analyte	Concentration
Sodium (M)	3.7
Uranium (M)	0.002
Sodium Aluminate (M)	1.2
Nitrate (M)	0.6
Nitrite (M)	0.9
Hydroxide (M)	1.0
Silicate (M)	0.02
Pu (mg/L)	0.2
Strontium-90 (μCi/L)	880
Cesium-137 (μCi/L)	840

2.2.7 Evaporation of PUREX Coating Removal Waste (3rd Quarter 1969)

In the third quarter of calendar year 1969, approximately 327,000 gallons of supernatant were transferred from tank 241-B-107 to tank 241-B-103, then to tank 241-BY-103 for processing in the in-tank solidification unit number 1 (ARH-1200C, page 5). The volumes of supernatant and sludge remaining in tank 241-B-107 were 0-gallons and 200,000 gallons, respectively. No additional waste transfers into or waste removal from tank 241-B-107 occurred until June 1972, when saltwell pumping of this tank was initiated

2.2.8 Saltwell Pumping Interim Stabilization

Removal of liquid from tank 241-B-107 was intermittently conducted from June 1972 (PPD-493-6-DEL, page AIV-21) through January 1978 as part of the program to remove interstitial liquid (i.e., saltwell pumping) from the single-shell tanks (letter 60410-78-092). A total of 41,500 gallons of liquid waste were reported as being pumped from tank 241-B-107 to tank 241-B-102 during this period.

Tank 241-B-107 was administratively declared interim stabilized on March 20, 1985 (HNF-SD-RE-TI-178, pages 33 and 34).

2.2.9 Comparison with Other Reports

Waste transfers into and waste removals from tank 241-B-107 are summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132) for 1945 through 1980, *Supporting Document for the Historical Tank Content Estimate for B-Tank Farm* (WHC-SD-WM-ER-310), *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311), and the Tank Waste Information Network (http://twins.pnl.gov:8001/twins.htm). The information cited in Sections 2.2.1 through 2.2.8 is in general agreement with these previous reports. These previous reports accurately state the volume of waste transferred into and removed from tank 241-B-107, as well as the volume of solids and total waste stored.

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997.*

It has been established in Section 2.0 that first decontamination cycle (1C) waste mixed with coating removal waste (CW) from the 221-B Bismuth Phosphate plant was transferred into tank 241-B-107, concentrated 1C/CW supernatant, concentrated TBP Plant supernatant, and coating removal waste from the PUREX Plant. The following sections provide a discussion of the processed that generated these waste types.

3.1 221-B AND 221-T BISMUTH PHOSPHATE PROCESS PLANT

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from irradiated nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion. The Bismuth Phosphate process was operated in B-Plant from April 1945 (HW-7-1649-DEL, page 21) through June 1952 (HW-25227-DEL, pages Ed-5 and Ed-6), after which the inventory of radioactive materials was removed from the facility from July 1952 through March 1953 (HW-27774). The Bismuth Phosphate process was operated in T-Plant from December 1944 (HAN-45800-DEL, page 4) through March 1956, after which the inventory of radioactive materials was removed from the facility from March 1956 (HW-42219-DEL, page ED-5) through September 1956 (HW-45707-DEL, page D-5). T-Plant was placed in lay-away status in October 1956 (HW-46432-DEL, page D-5).

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste sometimes referred to as coating waste (CW) was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

The fuel element uranium cores (see item [2] in Figure 2) were then dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution, and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented its precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed with water to separate the acidic supernatant from the precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble, and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW). Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). Of the predominate radionuclides remaining in the waste, the laboratory tests indicate the percentage of cesium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively.

The plutonium-bearing cake was then dissolved in nitric acid, and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products (e.g., cerium, niobium, ruthenium, and zirconium), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C waste) were transferred to the same single-shell tank as the coating removal waste. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids from the first decontamination cycle were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28).

During operation of B-Plant, the 1C waste was combined with the coating removal waste and transferred to the same single-shell tank. This same practice was conducted in T-Plant from December 1944 through October 19, 1954. Beginning on October 20, 1954, nickel ferrocyanide scavenging of the 1C waste was conducted in T-Plant to precipitate cesium-137 and strontium-90 (HW-33585-DEL, page Ed-8 and HW-33184). The precipitated 1C waste slurry was transferred separate from the coating removal waste to single-shell tanks for settling of the precipitate and discharge of the scavenged (i.e., cesium and strontium depleted) supernatant to a crib.

Table 5 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the 221-B/T bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C/CW, and 2C that was stored in single-shell tanks are provided in Tables 6 and 7. These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Figure 2. Bismuth Phosphate Process Diagram

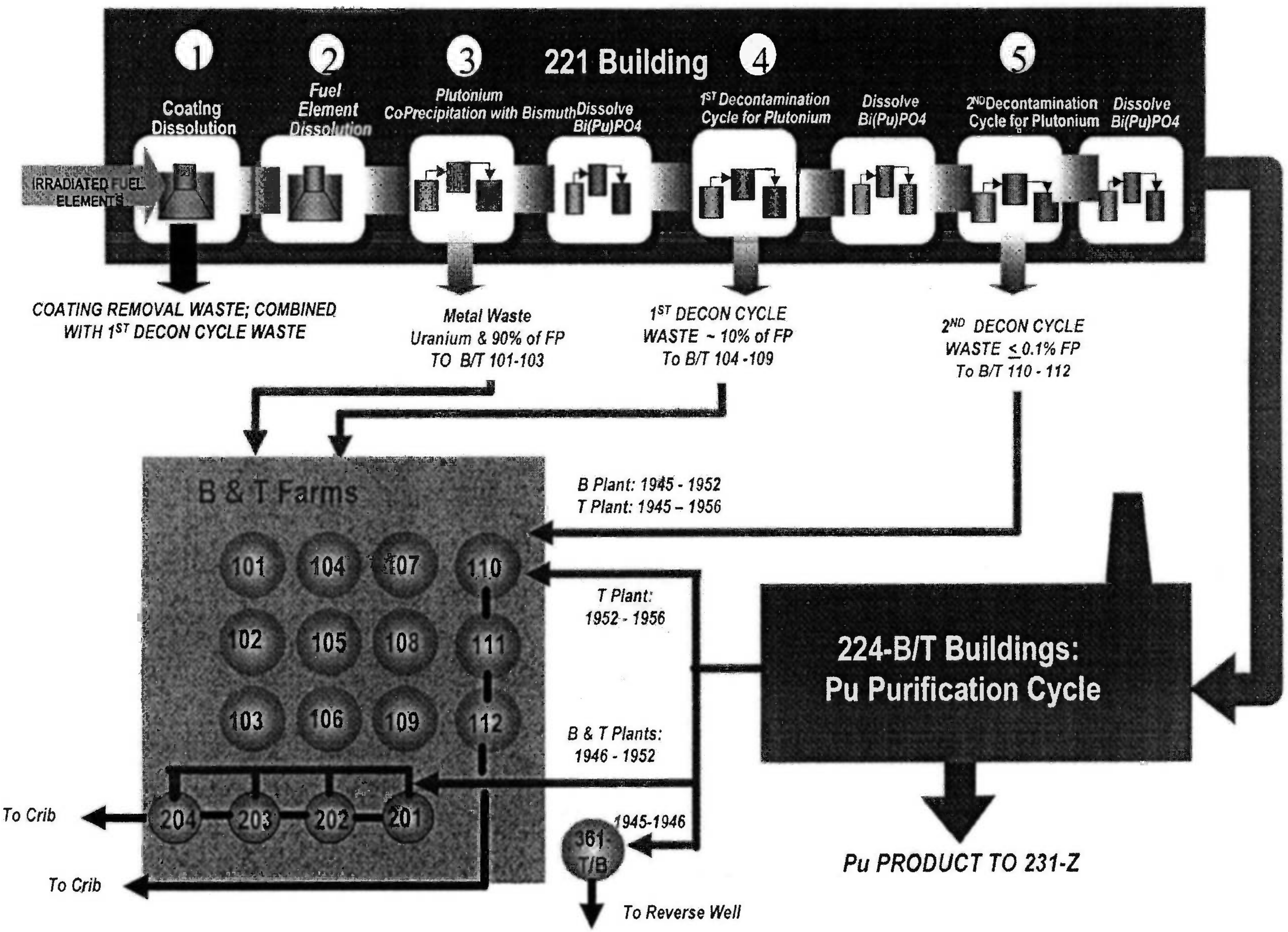


Table 5. Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet [1]

Analyte [2]	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04 [6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02 [6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

(1) See HW-23043

(2) Analyses are reported in grams per liter, except for gamma activity, which is counts/minute/mL.

(3) HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.

(4) Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).

(5) Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).

(6) Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

Table 6. Analyses of Bismuth Phosphate Process Supernatants Stored

Waste Type [1,2]	Tank	pH	Pu µg/L	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	10	35	110[5]	25[5]	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? [3]	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µg/L**	**Gross Beta Counts / minute/ cc**	**Gross Gamma Counts / minute/ cc**	**Date Sampled**
2C	T-110	Not reported [4]	15	4.9E+04	30	7-13-1945
2C	T-110	9.8[4]	19	6.9E+04	55	7-25-1945
2C	B-110	9.6[4]	8.5	7.0E+04	55	7-25-1945

Notes:

(1) See HW-10728 and HW-3-3220.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analyses for tank 241-B-112 seem to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 1C and 2C wastes were neutralized to a pH of approximately 10. The waste collected in tanks 241-B-110, 241-B-111, 241-B-112, 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Decrease in gross beta and gross gamma concentrations shown for the tank 241-T-101 waste samples are due to decay of fission products with short half-lives.

Table 7. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant

Tank	Date Filled	Pu μg/cc	Gross Beta μCi/cc	Gross Gamma μCi/cc	Sr μCi/cc	Cs μCi/cc	Ru μCi/cc	Rare Earths + Y – Ce μCi/cc	Ce μCi/cc	Nb μCi/cc	Zr μCi/cc	Te μCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.12	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.12	Not reported	0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.005	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.02**	**0.15**						

Notes:

[1] HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

[2] HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

[3] Tank 241-TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

3.1.1 221-T and 221-B Plant Cell Drainage Waste

During the operation of the 221-B and 221-T Bismuth Phosphate plants, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B and 221-T Plants contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High activity waste collected in 221-T Plant and 221-B Plant tanks 5-9 could be jetted to single-shell tank 241-T-107 and 241-B-107, respectively (HW-10475-C, page 918). Alternatively, the cell drainage waste could be transferred to process vessels with the 221-T (or 221-B) Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-DEL, page 28). The T-Plant stack drainage waste was also collected as part of the 221-T Plant cell drainage until May 28, 1951, after which the stack drainage was routed to the cascade of single-shell tank 241-TX-113, 241-TX-114, and 241-TX-115 (HW-21260-DEL, page 58).

From April 1945 through September 4, 1947 (HW-33591, page 3), the 221-B Plant low activity cell drainage waste collected in tank 5-6 was transferred to tank 241-B-361, which gravity drained to reverse well number 241-B-361 (also referred to as 216-B-5). Tank 241-B-361 also received waste from the 224-B Concentration building from May 1945 to October 1946. Crib number 5-6 was used to dispose of the cell drainage waste from August 12, 1948 through July 4, 1951 (HW-33591, page 3). Cell drainage waste was routed to cribs 241-B-1 and 241-B-2 from October 3, 1947 through August 12, 1948 (HW-44784, page 27). After July 4, 1951, the 221-B Plant cell drainage waste was transferred along with 2C waste to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (HW-21506-DEL, pages 56 and 57) and discharged to the 241-B-3 (also referred to as crib 216-B-8) until July 1953 and then the 241-B-1 and 241-B-2 cribs from December 1954 through October 1955 (HW-44784, page 27).

The 221-T Plant cell drainage waste collected in tank 5-6 was transferred to reverse well number 216-T-3 from January 1945 through August 1946. Crib number 216-T-6 was used to dispose of the cell drainage waste from August 1946 through June 1951. After June 1951, the 221-T Plant cell drainage waste was transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 (HW-55176, part V). The quantity and composition of the cell drainage solutions discharged from tank 5-6 varied (see HW-20583, page 4 and HW-33591, page 25).

3.2 221-B PLANT FISSION PRODUCTS PROCESSING

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

3.2.1 Strontium and Rare Earths Processing

This section is included to provide information on the different waste processing activities conducted in B-Plant. However, these waste processing activities did not result in the transfer of any of these waste types into tank 241-B-107.

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, pages B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144, and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, and cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.2.2 Cesium and Strontium Processing

This section is included to provide information on the different waste processing activities conducted in B-Plant. However, these waste processing activities did not result in the transfer of any of these waste types into tank 241-B-107.

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917). After separation of cesium, the alkaline supernatants were transferred directly to underground storage tanks. The ion exchange process used an ammonium carbonate / ammonium hydroxide solution to separate sodium from cesium on the ion exchange media. The aqueous wastes that contained ammonium were processed in the Cell 23 evaporator to concentrate these wastes and volatilize ammonia before transferred to underground storage tanks.

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PR-REPORT-SEP68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges. The PUREX high-level waste sludges were dissolved in nitric acid (known as PAS) in the 244-AR Vault and transferred to B-Plant for centrifugation to separate solids. The clarified solution was process in the solvent extraction equipment to separate strontium (PRD-SEP-68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until 1977. The aqueous waste from the solvent extraction process was evaporated in the Cell 23 evaporator and transferred to underground storage tanks.

3.3 PUREX PLANT

The PUREX plant was operated from 1956 through 1988 to reprocess irradiated nuclear fuels. The PUREX Plant processed both aluminum coated and zirconium clad irradiated nuclear fuels. For the aluminum coated fuel, the fuel coating was dissolved in sodium hydroxide solution. The coating removal waste (designated as CW) was inherently alkaline and did not require neutralization before transfer to underground storage tanks. The zirconium clad fuel; Zircaloy®[1] (98.5% Zr and 1.5% Sn), was dissolved in a solution of ammonium fluoride and ammonium nitrate. The zirconium cladding waste was neutralized (designated as NCRW) by addition of sodium hydroxide solution before transfer to underground storage tanks (PFP-P-020-00001).

[1] Zircaloy® is a trademark of Teledyne Wah Chang, Albany, Oregon.

After dissolving the coating / cladding on the irradiated nuclear fuel, the uranium fuel elements were then dissolved. The dissolved fuel elements are then processed through a solvent extraction system that used tri-butyl phosphate solvent in a normal paraffin hydrocarbon diluent. The fission products and impurities separated during the uranium and plutonium solvent extraction process were neutralized and transferred underground storage tanks, forming supernatant and sludges within the tanks. The supernatant, known as PUREX supernatant neutralized (PSN) were stored separately in the 200 East Area tank farms and eventually processed in the B-Plant to remove cesium. The plutonium solutions generated at the PUREX Plant were transferred to the 234-5Z building (Z-Plant) for further processing. Uranium solutions were transferred to the 224-U building (UO_3 Plant) for conversion to an oxide and transfer to offsite facilities for re-use in the fabrication of nuclear fuel.

3.4 TRI-BUTYL PHOSPHATE (TBP) PLANT

The 221-U Plant was originally constructed and contained equipment for conducting the Bismuth Phosphate process, similar to 221-B and 221-T Plants. However, the Bismuth Phosphate process was never conducted in the 221-U Plant. Instead, the equipment in the 221-U Plant was replaced with a solvent extraction process to separate uranium from stored Bismuth Phosphate metal waste. The uranium solvent extraction process used tri-butyl phosphate (TBP) as the solvent dissolved in a hydrocarbon diluent. The so-called Tri-Butyl Phosphate Plant derived its name from the solvent used to separate uranium from the metal waste.

Processing of metal waste solutions in the TBP Plant was conducted from November 1952 (HW-26376-DEL, page Ed-3) through March 1957 (HW-51240). In the TBP Plant, there were two parallel processing lines (Line A and Line B) with identical equipment. The following discussion is applicable to either processing line.

Metal waste stored in the single-shell tanks consisted of precipitated sludge and supernatant. Both the supernatant and sludge contained uranium. The metal waste supernatant was first removed from a cascade of the single-shell tanks and collected in a separate single-shell tank. Metal waste sludge was then sluiced from a single-shell tank using the metal waste supernatant that was previously collected. The metal waste slurry was accumulated in several stainless steel tanks contained in an underground concrete vault. The metal waste sludge was allowed to settle in the stainless steel tank and the supernatant removed for re-use in sluicing sludge. The metal waste sludge was then dissolved in nitric acid and combined with metal waste supernatant. The nitric acidic concentration of the metal waste was adjusted to ensure the waste was stabile and did not form precipitates (HW-19140, pages 216 - 219).

The acidic metal waste solution was then transferred to the TBP Plant. In the TBP Plant, the acidic metal waste was evaporated to remove excess liquid and centrifuged to remove solids (HW-19140, pages 311 - 312). The clarified acidic solution was transferred to the RA pulse-column that contained tri-butyl phosphate solvent in a hydrocarbon diluent.

In the RA column, uranium was extracted from the acidic solution into the organic solvent phase. A dilute nitric acid scrub solution was introduced into the RA column to remove trace amount of cesium and strontium fission products that were co-extracted with the uranium. Cerium, ruthenium, niobium, and zirconium fission products are co-extracted with the uranium. The scrub solution also contained ferrous ammonium sulfate to reduce plutonium to the III valence state and prevent extraction along with the uranium into the organic solvent phase. Therefore, plutonium and cesium and strontium fission products remained in the aqueous phase along with approximately 0.5 percent of the uranium present in the feed to the column (HW-19140, pages 405 - 420). The aqueous waste leaving the RA column was known as the RAW stream.

The organic solvent phase containing the uranium and co-extracted fission products (cerium, ruthenium, niobium, and zirconium) was transferred to the RC pulse-column where uranium along with co-extracted plutonium and fission products were stripped from the solvent using 0.01 M nitric acid (HW-19140, pages 421 – 423). The 0.01 M nitric acid strip solution containing the recovery uranium was transferred to the 224-U Building (UO_3 Plant) for further processing. In the UO_3 Plant, the uranium nitrate solution was evaporated to reduce the solution volume, calcined, and packaged for transportation off-site.

The organic solvent from the RC column was transferred to the RO pulse-column for removal of organic degradation products. The organic solvent was contacted with 0.4 M sodium sulfate to remove organic degradation products (HW-19140, pages 1111 – 1112). The aqueous waste solution from the RO column (designated as ROW stream) was combined with the RAW stream for treatment.

The combined RAW and ROW waste solutions were neutralized using sodium hydroxide solution to a pH greater than 9.5 (HW-19140, page 1206). Neutralization of the combined RAW and ROW waste resulted in the formation of sodium salts (e.g., sodium nitrate, sodium sulfate, and sodium phosphate). The neutralized RAW / ROW waste was then concentrated to minimize the volume of waste. Ammonia was evolved from the neutralized waste during the concentration step. The concentrated TBP Plant waste was then transferred to the single-shell tanks for storage (HW-19140, pages 1206 - 1209).

Beginning on September 29, 1954, the TBP Plant RAW / ROW waste was treated within the 221-U Plant to precipitate cesium-137 and strontium-90 (HAN-62359-DEL, monthly report for September 1954, page 44). Cesium-137 and strontium-90 were precipitated by adding potassium ferrocyanide, sodium hydroxide, and nickel sulfate to the acidic TBP Plant waste (HW-30399 and HW-31731). The scavenged TBP Plant (RAW / ROW) waste was not concentrated. The scavenged TBP Plant waste was transferred to single-shell tanks where the nickel ferrocyanide ($Ni_2Fe(CN)_6$) precipitate was allowed to settle. The scavenged TBP Plant supernatant was then discharged to cribs or trenches (HW-48518, pages 15 to 20).

3.5 242-B WASTE EVAPORATOR

The 242-B Evaporator was designed to process 1C/CW supernatant from the 221-B Bismuth Phosphate Plant. The 242-B Evaporator design capacity for processing 1C/CW supernatant was approximately 500 gallons per hour. The evaporator was a pot type evaporator with internal steam heating coils. The evaporator vessel and associated piping was constructed of stainless steel to although for decontamination with nitric acid. The evaporator vessel was contained in a structure with 18-inch concrete walls to provide radiation shielding (ART-11953).

The evaporator was constructed adjacent to the 241-B Tank Farm from July 1951 (HW-21802-DEL, page 43) through December 8, 1951 (HW-23140-DEL, page 34). Tank 241-B-106 was used as the feed tank to the evaporator.

The evaporator commenced processing stored 1C/CW supernatant on December 14, 1951 (HW-23140-DEL, page 34). The 1C/CW supernatant that had been stored in single-shell tanks within 241-B, 241-C, 241-BX and 241-BY Tank Farms was processed through the evaporator from December 14, 1951 through February 1953. The concentrated 1C/CW supernatant was stored in tanks 241-B-104, 241-B-105, 241-B-107, 241-B-108, and 241-B-109.

The concentrated 1C/CW supernatant contained in tanks 241-B-104, 241-B-105, 241-B-107, 241-B-108, and 241-B-109 was reprocessed in the 242-B Evaporator from February 18, 1953 (HW-27842, page 9) through July 1953 (HW-29054, page 2) and stored in tanks 241-B-107, 241-B-108, and 241-B-109.

The 242-B Evaporator was then used to process waste from the TBP Plant that had been stored in 241-C Tank Farm. On September 20, 1953, TBP Plant waste was transferred from tank 241-C-112 to tank 241-B-106 for processing in the 242-B Evaporator (HW-29624, pages 2 and 4). The concentrated TBP Plant waste was stored in tank 241-B-104 (HW-29624, page 4). TBP Plant waste stored in tank 241-BX-109 was processed through the 242-B Evaporator in October 1953, with the concentrated TBP Plant waste stored in tank 241-B-104 (HW-29905, page 4). Tank 241-BX-109 was used to receive waste from the TBP Plant waste, which was periodically transferred to tank 241-B-106 for processing through the 242-B Evaporator. The TBP Plant waste was processed through the 242-B Evaporator from October 1953 (HW-30250, pages 4 and 5) through October 1954 (HW-33544, page 4). TBP Plant waste that was stored in tank 241-BX-108 was also transferred to tank 241-B-106 on March 21, 1954 for processing through the 242-B Evaporator (HW-31374, page 5). The concentrated TBP Plant wastes were stored in tanks 241-B-101, 241-B-102, 241-B-103, 241-B-105, 241-B-107, 241-B-109, 241-B-110, 241-B-111, 241-BX-110, 241-BX-111, and 241-BX-112.

The 242-B Evaporator was shut down on October 28, 1954 (HW-45163-RD, page 71). Evaporation of the TBP Plant waste was no longer conducted. As discussed in Section 3.4, beginning on September 29, 1954, the TBP Plant waste was treated in the 221-U Plant to precipitate cesium-137 and strontium-90 before being discharged to the single-shell tanks. The treated TBP Plant waste, known as scavenged waste was transferred to single-shell tanks where the precipitate was allowed to settle. The scavenged TBP Plant supernatant was then discharged cribs or trenches.

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-B-107

Two core samples (number 217 and 218) of the waste contained in tank 241-B-107 were obtained in July 1997. All segments of core sample 217 were analyzed for anions, cations, and total alpha emitting radionuclides. All segments of core sample 218 were analyzed for anions and cations. However, because of poor sample recovery, only the lower two segments of core sample 218 were analyzed for alpha emitting radionuclides. No additional radionuclide analyzes were conducted on the tank 241-B-107 core samples.

Waste templates were used to estimate the concentration of individual radionuclides present in the tank 241-B-107 waste[2]. Based on the relatively high aluminum and low sodium content and the tank fill history (see Section 2.2.6), the top layer of waste in tank 241-B-107 is assumed to be PUREX coating removal waste. The middle layer of waste in tank 241-B-107 is assumed to be saltcake based on the relatively high sodium to insoluble metal mass ratio and the tank fill history, which included the storage of concentrated 1C/CW supernatant in tank 241-B-107 (see Section 2.2.2). The bottom layer of waste in tank 241-B-107 is assumed to be 1C/CW sludge based on the relatively high insoluble metal content and the tank fill history (see Section 2.2.1). Waste templates for each of these waste types and the estimated volume of each waste layer were then applied to estimate the concentration of radionuclides present in the tank 241-B-107 waste. These estimates are known as the best-basis inventory.

Table 8 provides the best-basis inventory for transuranic elements (i.e., neptunium-237, plutonium-238, plutonium-239, plutonium-240, and americium-241), cesium-137, and strontium-90 contained in the tank 241-B-107 sludge and saltcake, as reported on June 3, 2003 from the Tank Waste Information Network (TWINS) database[2]. The concentration of transuranic elements in the tank 241-B-107 sludge is estimated to be 531.7ηCi/g. The cesium-137 and strontium-90 concentrations in the tank 241-B-107 sludge are estimated to be 28.4μCi/g and 222.4μCi/g.

The inventories of transuranic elements, cesium-137, and strontium-90, in tank 241-B-107 sludge are also compared to the inventory of these radionuclides present in all 177 underground storage tanks at the Hanford Site in Table 8. The inventory of transuranic elements in tank 241-B-107 sludge is approximately 0.13 percent of the total inventory of transuranic elements present in all 177 underground storage tanks at the Hanford Site. The inventories of cesium-137 and strontium-90 in tank 241-B-107 sludge are approximately 0.03 percent and 0.24 percent of the total inventory of cesium-137 and strontium-90 present in all 177 underground storage tanks at the Hanford Site.

[2] See Tank Waste Information Network System (http://twins.pnl.gov:8001/twins.htm) for discussion of waste templates and application for estimating waste composition.

Table 8. Transuranic Elements and Fission Products in Tank 241-B-107

Tank	TRU		Cs-137		Sr-90	
	ηCi/g	Ci	μCi/g	Ci	μCi/g	Ci
241-B-107 Sludge	531.7	285.2	28.4	15,210	222.4	119,270
241-B-107 Saltcake	30.0	13.7	16.8	7,690	5.6	2,560
All 177 Tanks	Not applicable	226,511	Not applicable	46,080,000	Not applicable	50,280,000
241-B-107 Sludge as a percentage of all 177 tanks		0.13%		0.03%		0.24%

Note: TRU = Transuranic

5.0 SUMMARY

The waste types received in tank 241-B-107 and their disposition are summarized in Table 9. Based on the waste transfer history, the 86,000 gallons of sludge stored in tank 241-B-107 is a mixture of 1C/CW sludge from the 221-B Bismuth Phosphate Plant and PUREX coating removal waste. Tank 241-B-107 also contains 75,000 gallons of saltcake, which is from 221-B 1C/CW supernatant that had been concentrated in the 242-B Evaporator.

The estimated concentration of transuranic elements present in the sludge stored in tank 241-B-107 is approximately 531.7 ηCi/g. The estimated concentrations of cesium-137 and strontium-90 in the sludge contained in tank 241-B107 are approximately 28.5 μCi/g and 222.4 μCi/g.

Table 9. Waste Transfer History for Tank 241-B-107

Date	Waste Type	Source	Disposition	Waste Volume[1] in Tank 241-B-107	
				Supernatant (gallons)	Sludge (gallons)
04/1945 to 04/1946	1C/CW	221-B Plant	Received 1,590,000 gallons of 1C/CW waste that cascaded into tanks 241-B-108 and 241-B-109. 1C/CW precipitated during storage.	530,000 total	
12/1951 to 08/1953	Concentrated 1C/CW Supernatant	242-B Evaporator	Processed 1C/CW supernatant from multiple tanks in 242-B Evaporator for concentration and storage. Stored 331,000 gallons of concentrated 1C/CW supernatant in tank 241-B-107. Re-evaporated 1C/CW supernatant contained in B-Farm tanks in 242-B Evaporator and stored in tanks 241-B-107, 241-B-108, and 241-B-109.	358,000	172,000
08/1954	Concentrated 1C/CW Supernatant		Transferred 320,375 gallons of concentrated 1C/CW supernatant to 216-B-37 trench for disposal.	0	225,000
10/1954 to 09/1957	TBP Plant Waste Supernatant	242-B Evaporator	Transferred 305,000 gallons of concentrated TBP Plant supernatant from 242-B Evaporator to tank 241-B-107.	305,000	225,000
09/1957	TBP Plant Waste Supernatant		Transferred 264,000 gallons of concentrated TBP Plant supernatant from tank 241-B-107 to tank 241-C-101 for scavenging in 244-CR Vault.	0	261,000
3rd Quarter 1963	PUREX Coating Removal Waste	Tank 241-C-102	Received 264,000 gallons of PUREX coating removal waste.	264,000	261,000
3rd Quarter 1969	PUREX Coating Removal Waste		Transferred 327,000 gallons of supernatant to In-Tank Solidification Unit No. 1 for concentration and storage.	0	201,000
06/1972 to 03/1985	Supernatant and Interstitial Liquids		Saltwell pumped tank as part of interim stabilization program.	0	194,000

[1] The reported waste volumes are for the end of the date period.

6.0 REFERENCES

60410-78-092, 1978, *Summary of Salt Well Pumping Status for the Period Ending April 30, 1978*, (internal letter from D. R. Autery to J. W. Bailey, May 17), Rockwell Hanford Operations, Richland, Washington.

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-917, 1977, *Evaluation of Phosphotungstic Acid Process for Removal of Cesium-137 from PUREX Current Acid Waste,* Atlantic Richfield Hanford Company, Richland, Washington.

ART-11953, 1953, *How Hanford Evaporates Fission Waste*, pages 184-185, November 1953, Chemical Engineering.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doe/culres/mpd/toc.htm, U. S. Department of Energy, Richland Operations Office, Richland, Washington.

H-2-2076, *First Cycle Evaporation 241 B, C, BX & BY Tank Pump Arrangement & Details*, Rev. 1, General Electric Company, Richland, Washington.

H-2-44502, Flow *Diagram Waste Transfer and Storage Facilities*, Sheet 12, Rev. 5, General Electric Company, Richland, Washington.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944 through December 1946*, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-45801-DEL, 1947, *200 Area Monthly Production Report, December 30, 1946 through June 30, 1947*, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-62359-DEL, 1955, *200 Area Monthly Reports for 1954*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-90907, 1965, *Monthly Status and Progress Report for February 1965*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95105-DEL, 1966, *Monthly Status and Progress Report for June 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95284-DEL, 1966, *Monthly Status and Progress Report for July 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96590-DEL, 1967, *Monthly Status and Progress Report for Januar1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96805-DEL, 1967, *Monthly Status and Progress Report for February 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97066-DEL, 1967, *Monthly Status and Progress Report for March 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-98918-DEL, 1967, *Monthly Status and Progress Report for October 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99396-DEL, 1967, *Monthly Status and Progress Report for December 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99604-DEL, 1968, *Monthly Status and Progress Report for January 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100127-DEL, 1968, *Monthly Status and Progress Report for March 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100357-DEL, 1968, *Monthly Status and Progress Report for April 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HNF-SD-RE-TI-178, 2003, *Single-Shell Tank Leak Stabilization Record*, Rev. 8, CH2M HILL Hanford Group Inc., Richland Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10728, 1948, *Process Waste Data – 200 Areas*, (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report September 1950*, General Electric Company, Richland, Washington.

HW-19140, 1951, *Uranium Recovery Technical Manual*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report December 1950*, General Electric Company, Richland, Washington.

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.

HW-26376-DEL, 1952, *Hanford Works Monthly Report for November 1952*, General Electric Company, Richland, Washington.

HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.

HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952,* General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, July, August, September 1952,* General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, October, November, December 1952,* General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, January 1953,* General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations – Operations, June 30, 1953*, General Electric Company, Richland, Washington.

HW-29054, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, July 31, 1953*, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, August 31, 1953*, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, September 30, 1953*, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, October 31, 1953*, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.

HW-30399, 1954, *TBP Plant Nickel Ferrocyanide Scavenging Flowsheet, January 1954*, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

HW-31731, 1954, *TBP Waste Scavenging*, General Electric Company, Richland, Washington.

HW-33184, 1954, *BiPO4 Plant Nickel Ferrocyanide Scavenging Flowsheet for First Cycle Waste Containing No Coating Removal Waste*, General Electric Company, Richland, Washington.

HW-33536, 1954, *Nickel Ferrocyanide Scavenging Flowsheet for Neutralized Concentrated RAW*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33585-DEL, 1954 *Hanford Atomic Products Operation Monthly Report for October 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33962-DEL, 1954, *Hanford Atomic Products Operations Monthly Report for November 1954*, General Electric Company, Richland, Washington.

HW-34281, 1954, *First Cycle Supernatant Ground Disposal*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1955*, General Electric Company, Richland, Washington.

HW-38955, 1955, *In-Farm Scavenging Operating Procedure and Control Data*, General Electric Company, Richland, Washington.

HW-42219-DEL, 1956, *Hanford Atomic Products Operation for March 1956*, General Electric Company, Richland, Washington.

HW-44784, 1956, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1956*, General Electric Company, Richland, Washington.

HW-45163-RD, 1955, *Tank Farms and Waste Evaporator Weekly Summary, Process Unit, Period 0800 12/31/53 – 0800 01/14/55*, General Electric Company, Richland, Washington.

HW-45707-DEL, 1956, *Chemical Processing Department Monthly Report for September 1956*, General Electric Company, Richland, Washington.

HW-46432-DEL, 1956, *Chemical Processing Department Monthly Report for October 1956*, General Electric Company, Richland, Washington.

HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through December 1956*, General Electric Company, Richland, Washington.

HW-51240, 1957, *Final Report – The Metal Waste Removal and Metal Recovery Layaway Operations in 200 West Area*, General Electric Company, Richland, Washington.

HW-52493, 1957, *Current Inventory of Hanford Wastes*, General Electric Company, Richland, Washington.

HW-52824, 1957, *Ultimate Disposal of PUREX Wastes*, General Electric Company, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-53336, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1957*, General Electric Company, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-55176 – Pt. V, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.

HW-55593, 1958, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through December 1957*, General Electric Company, Richland, Washington.

HW-57649, 1958, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1958*, General Electric Company, Richland, Washington.

HW-63051, 1961, *The Recovery of Fission Product Rare Earth Sulfates from PUREX IWW*, General Electric Company, Richland, Washington.

HW-69011, 1961, *Project CGC-897 – Title I Design Fission Product Storage in B-Plant*, General Electric Company, Richland, Washington.

HW-69534, 1961 *Laboratory Development of a Carrier Precipitation Process for the Recovery of Strontium from PUREX Wastes*, General Electric Company, Richland, Washington.

HW-71187-DEL, 1961, *Chemical Processing Department Monthly Report for September 1961*, General Electric Company, Richland, Washington.

HW-76848-DEL, 1963, *Chemical Processing Department Monthly Report for February 1963*, General Electric Company, Richland, Washington.

HW-77016, 1963, *B-Plant Phase I Information Manual*, General Electric Company, Richland, Washington.

HW-78817-DEL, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-81373, 1964, *Removal of Lead from B-Plant Cerium and Rare Earth Fractions*, General Electric Company, Richland, Washington.

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

PPD-493-6-DEL, 1972, Monthly Status and Progress Report June 1972, Atomic Energy Commission, Richland Operation Office, Richland, Washington.

PFP-P-020-00001, 1982, *PUREX Flowsheet – Reprocessing N Reactor Fuels*, Rockwell Hanford Operations, Richland, Washington.

PR-REPORT-SEP68-DEL, 1968, *Monthly Status and Progress Report September 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

RHO-RE-SA-169, 1986, *Sixteen Years of Cesium Recovery Processing at Hanford's B-Plant*, Rockwell Hanford Operations, Richland, Washington.

RL-SEP-197, 1965, *Chemical Processing Department Monthly Report December 1964*, General Electric Company, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Hanford Atomic Products Operation, Richland, Washington.

WHC-MR-0089, 1989, *Status of TBP Scavenged Waste August 1955 to October 1957*, Westinghouse Hanford Company, Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-ER-310, 1996, *Supporting Document for the Historical Tank Content Estimate for B-Tank Farm*, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

VOLUME OF WASTE IN TANK 241-B-107

January 1945 through May 1977

This page intentionally left blank.

Table A-1. VOLUME OF WASTES IN TANK 241-B-107

Year	Month	Percentage filled [1]	Reference	Page	Comments
1945	January	Empty	HW-7-1293-DEL	15	B-Plant construction scheduled for completion on February 10, 1945.
	February	Empty	HW-7-1388-DEL	16	Operations assumed responsibility for B-Plant with completion of construction on February 10, 1945. No waste transferred into tank 241-B-107.
	March	Empty	HW-7-1544-DEL	22	Completed cold chemical runs at B-Plant. No waste transferred into tank 241-B-107.
	April	Not reported	HW-7-1649-DEL	18 and 21	Processing started on April 13, 1945. Nine charges of irradiated fuel slugs dissolved at B-Plant, with four charges completed through processing. 1C/CW waste from 221-B Plant collected in cascade of tanks 241-B-107, 241-B-108, and 241-B-109.
	May	8.2%	HW-7-1793-DEL	22	1C/CW waste from 221-B Plant collected in cascade of tanks 241-B-107, 241-B-108, and 241-B-109.
	June	10.6%	HW-7-1981-DEL	23	Same as above.
	July	15.2%	HW-7-2177-DEL	22	Same as above.
	August	22.3%	HW-7-2361-DEL	21	Same as above.
	September	30.0%	HW-7-2548-DEL	22	Same as above.
	October	40.9%	HW-7-2706-DEL	21	Same as above.
	November	54.6%	HW-7-2957-DEL	21	Same as above.
	December	61.7%	HW-7-3171-DEL	21	Same as above.
1946	January	71.02%	HW-7-3378-DEL	24	Same as above.
	February	81.6%	HW-7-3566-DEL	21	Same as above.
	March	89.3%	HW-7-3751-DEL	21	Same as above.
	April	100%	HW-7-4004-DEL	20 - 21	Cascade of tanks 241-B-107, 241-B-108, and 241-B-109 filled with 1C/CW waste. The 1C/CW waste from the 221-B Plant was diverted to tank 241-C-110 in 241-C Farm on April 24, 1946.
	May	100%	HW-7-4193-DEL	21	1C/CW waste from the 221-B Plant collecting in cascade of tanks 241-C-110, 241-C-111, and 241-C-112 in 241-C Farm.
	June	100%	HW-7-4343-DEL	23	Same as above.
	July	100%	HW-7-4542-DEL	22	Same as above.
	August	100%	HW-7-4739-DEL	23	Same as above.
	September	100%	HW-7-5194-DEL	26	Same as above.
	October	100%	HW-7-5362-DEL	28	Same as above.
	November	100%	HW-7-5505-DEL	28	Same as above.
	December	100%	HW-7-5630-DEL	25	Same as above.

Table A-1. VOLUME OF WASTES IN TANK 241-B-107

Year	Month	Percentage filled [1]	Reference	Page	Comments
1947	January	100%	HW-7-5802-DEL	26	Same as above.
	February	100%	HW-7-5944-DEL	25	Same as above.
	March	100%	HW-7-6048-DEL	23 - 24	Cascade of tanks 241-C-110, 241-C-111, and 241-C-112 filled with 1C/CW waste. The 1C/CW waste from the 221-B Plant was diverted to cascade of tanks 241-C-107, 241-C-108, and 241-C-109 at end of March 1947. Began reducing the amount of sodium hydroxide added to the 1C/CW waste in order to promote precipitation of plutonium and bismuth.
	April	100%	HW-7-6184-DEL	26	1C/CW waste from the 221-B Plant collecting in cascade of tanks 241-C-107, 241-C-108, and 241-C-109.
	May	100%	HW-7-6391-DEL	24	Same as above.
	June	100%	HW-7-7454-DEL	26	Same as above.
	July	100%	HW-7283-DEL	26	Same as above.
	August	100%	HW-7504-DEL	27	Same as above.
	September	100%	HW-7795-DEL	27	Same as above.
	October	100%	HW-7997-DEL	27	Same as above.
	November	100%	HW-8267-DEL	29	Same as above.
	December	100%	HW-8438-DEL	27	Same as above.
1948	January	100%	HW-8931-DEL	28	Same as above.
	February	100%	HW-9191-DEL	29	Same as above.
	March	100%	HW-9595-DEL	31	Same as above.
	April	100%	HW-9922-DEL	32	Same as above.
	May	100%	HW-10166-DEL	32	Same as above.
	June	100%	HW-10378-DEL	30	Same as above.
	July	100%	HW-10714-DEL	32	Same as above.
	August	100%	HW-10993-DEL	36	Same as above.
	September	100%	HW-11226-DEL	32 - 33	Cascade of tanks 241-C-107, 241-C-108, and 241-C-109 filled with 1C/CW waste on September 14, 1948. The 1C/CW waste was diverted to tank 241-BX-107.
	October	100%	HW-11499-DEL	34	1C/CW waste from the 221-B Plant collecting in cascade of tanks 241-BX-107 and 241-BX-108. Tank 241-BX-109 not used to receive waste to allow for tie-in of lines to 241-BY Tank Farm.
	November	100%	HW-11835-DEL	36	Same as above.
	December	100%	HW-12086-DEL	37	Same as above.

Table A-1. VOLUME OF WASTES IN TANK 241-B-107

Year	Month	Percentage filled [1]	Reference	Page	Comments
1949	January	100%	HW-12391-DEL	39	Same as above.
	February	100%	HW-12666-DEL	35	Same as above.
	March	100%	HW-12937-DEL	40	Same as above.
	April	100%	HW-13190-DEL	40	Same as above.
	May	100%	HW-13561-DEL	42	Same as above.
	June	100%	HW-13793-DEL	41	Same as above.
	July	100%	HW-14043-DEL	42	Same as above.
	August	100%	HW-14338-DEL	43	Same as above.
	September	100%	HW-14596-DEL	42	Tanks 241-BX-107 and 241-BX-108 filled with 1C/CW waste. 1C/CW waste from the 221-B Plant collecting in cascade of tanks 241-BX-110 and 241-BX-111.
	October	100%	HW-14916-DEL	43	Same as above.
	November	100%	HW-15267-DEL	44	Same as above.
	December	100%	HW-15550-DEL	42	Same as above.
1950	January	100%	HW-15843-DEL	45	Same as above.
	February	100%	HW-17056-DEL	45	Same as above.
	March	100%	HW-17410-DEL	48	Same as above.
	April	100%	HW-17660-DEL	46	Same as above.
	May	100%	HW-17971-DEL	44	Same as above.
	June	100%	HW-18221-DEL	44	Tanks 241-BX-110 and 241-BX-111 filled with 1C/CW waste. Tanks 241-B-104 and 241-B-105 receiving 1C/CW waste from 221-B Plant.
	July	100%	HW-18473-DEL	45	Same as above.
	August	100%	HW-18740-DEL	49	Same as above.
	September	100%	HW-19021-DEL	48 - 49	Tanks 241-B-104 and 241-B-105 filled with 1C/CW waste. Cascade of tanks 241-BX-107, 241-BX-108, and 241-BX-109 again receiving 1C/CW waste from 221-B Plant.
	October	100%	HW-19325-DEL	50	Same as above.
	November	100%	HW-19622-DEL	49	Same as above.
	December	100%	HW-19842-DEL	51	241-BX-107 through 241-BX-111 filled with 1C/CW waste. The 221-B Plant 1C/CW waste cascading into tanks 241-BY-107, 241-BY-108, and 241-BY-109 via tanks 241-BX-107, 241-BX-108, and 241-BX-109.

Table A-1. VOLUME OF WASTES IN TANK 241-B-107

Year	Month	Percentage filled [1]	Reference	Page	Comments
1951	January	100%	HW-20161-DEL	49	The 221-B Plant 1C/CW waste cascading to tanks 241-BY-107, 241-BY-108, and 241-BY-109.
	February	100%	HW-20438-DEL	49	Same as above.
	March	100%	HW-20671-DEL	53	Same as above.
	April	100%	HW-20991-DEL	51	Same as above.
	May	100%	HW-21260-DEL	55	Same as above.
	June	100%	HW-21506-DEL	54	Same as above.
	July	100%	HW-21802-DEL	41	Same as above.
	August	Not reported	HW-22075-DEL		
	September	Not reported	HW-22304-DEL	39	The 221-B Plant 1C/CW waste was routed to tank 241-BX-112 in late August 1951, since the cascade of tanks 241-BY-107, 241-BY-108, and 241-BY-109 had become filled with 1C/CW waste.
	October	Not reported	HW-22610-DEL		
	November	Not reported	HW-22875-DEL		
	December	Not reported	HW-23140-DEL	34 - 35	242-B Evaporator was placed in operation on December 14, 1951. 242-B Evaporator processed 280,500 gallons of 1C/CW waste in December 1951.

[1] Percentage of tanks 241-B-107, 241-B-108, and 241-B-109 filled with waste. Three tanks combined can retain nominally 1,590,000 gallons of waste.

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Total Waste (Gallons)	Reference	Page	Comments
1952	January	Not Reported	HW-23437-DEL		
	February	Not Reported	HW-23698-DEL		
	March	Not Reported	HW-23982-DEL		
	April	220,000	HW-27838	8	1C/CW supernatant in tank 241-B-107 was processed in 242-B Evaporator, leaving 1C/CW sludge in tank 241-B-107. Concentrated 1C/CW waste from 242-B Evaporator being collected in tank 241-B-108. 1C/CW waste from 221-B Plant collecting in tank 241-BY-110.
	May	220,000	HW-27838	19 - 20	Tank 241-B-108 filled with concentrated 1C/CW waste from 242-B Evaporator on May 14, 1952. Tank 241-B-109 receiving concentrated 1C/CW waste from 242-B Evaporator on May 15, 1952. 1C/CW waste from 221-B Plant collecting in tank 241-BY-110.
	June	220,000	HW-27838	31	Same as above.
	July	220,000	HW-27839	9 - 10	Same as above.
	August	298,000	HW-27839	20 - 21	Tank 241-B-107 receiving concentrated 1C/CW waste from 242-B Evaporator beginning on August 21, 1952.
	September	461,000	HW-27839	31 - 32	Same as above. 1C/CW waste from 221-B Plant collecting in tank 241-BY-110.
	October	525,000	HW-27840	9 - 10	Same as above.
	November	531,000	HW-27840	20	Tank 241-B-107 receiving concentrated 1C/CW waste from 242-B Evaporator. Waste began cascading from tank 241-B-107 into tank 241-B-108 on November 25, 1952. Waste began cascading from tank 241-B-108 into tank 241-B-109 on November 30, 1952.
	December	531,000	HW-27840	31	Cascade of tanks 241-B-107, 241-B-108, and 241-B-109 filled on December 4, 1952 with 1C/CW sludge and concentrated 1C/CW supernatant from 242-B Evaporator. Tank 241-B-104 receiving concentrated 1C/CW supernatant from 242-B Evaporator.

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1953	January	311,000	220,000	HW-27841	9	Cascade of tanks 241-B-107, 241-B-108, and 241-B-109 filled on December 4, 1952 with 1C/CW sludge and concentrated 1C/CW supernatant from 242-B Evaporator. No waste transfers into this cascade. Tank 241-B-105 receiving concentrated 1C/CW supernatant from 242-B Evaporator.
	February	311,000	220,000	HW-27842	9	Transferred concentrated 1C/CW supernatant from tank 241-B-108 to tank 241-B-106 on February 18, 1953 for re-processing in the 242-B Evaporator. Receiving re-concentrated 1C/CW supernatant from the 242-B Evaporator into tank 241-B-108.
	March	311,000	220,000	HW-27775	8 - 9	Transferred concentrated 1C/CW supernatant from tank 241-B-109 to tank 241-B-106 on March 24, 1953 for re-processing in the 242-B Evaporator. Receiving re-concentrated 1C/CW supernatant from the 242-B Evaporator into tank 241-B-108.
	April	311,000	220,000	HW-28043	4	Receiving re-concentrated 1C/CW supernatant from the 242-B Evaporator into tank 241-B-109.
	May	4,000	220,000	HW-28377	4	Receiving re-concentrated 1C/CW supernatant from the 242-B Evaporator into tank 241-B-107.
	June	303,000	220,000	HW-28712	4	Tank 241-B-107 filled with 1C/CW sludge and re-concentrated 1C/CW supernatant.
	July	310,000	220,000	HW-29054	4	Same as above.
	August	358,000	172,000	HW-29242	4	
	September	358,000	172,000	HW-29624	4	
	October	358,000	172,000	HW-29905	4	
	November	358,000	172,000	HW-30250	4	
	December	358,000	172,000	HW-30498	4	

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1954	January	358,000	172,000	HW-30851	4	
	February	358,000	172,000	HW-31126	4	
	March	358,000	172,000	HW-31374	4	
	April	358,000	172,000	HW-31811	4	
	May	358,000	172,000	HW-32110	4	
	June	358,000	172,000	HW-32389	4	
	July	358,000	172,000	HW-32697	4	
	August	36,000	172,000	HW-33002	4	320,375 gallons of concentrated 1C/CW supernatant transferred from tank 241-B-107 to trench 241-BXR-3 (renamed 216-B-37) on August 31, 1954 (HW-33591, page 11). Concentrations of Cs, Sr, U, and Pu in supernatant transferred to trench were 0.82µCi/mL, 7.4E-03µCi/mL, 9.8E-07µCi/mL, and 2.38E-06µCi/mL, respectively. pH of waste was 8.0.
	September	0	225,000	HW-33396	4	Tank 241-B-107 contains 1C/CW sludge and concentrated 1C/CW interstitial liquid
	October	263,000	225,000	HW-33544	4	Transferred 263,000 gallons of concentrated TBP Plant waste from tank 241-B-105 to tank 241-B-107. Tank 241-B-105 received concentrated TBP Plant waste from 242-B Evaporator. Tank 241-B-107 contains 225,000 gallons of 1C/CW sludge and concentrated 1C/CW interstitial liquid and 263,000 gallons of concentrated TBP Plant waste.
	November	263,000	225,000	HW-33904	4	
	December	263,000	225,000	HW-34412	4	

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1955	January	Not legible	Not legible	HW-35022	4	
	February	263,000	225,000	HW-35628	4	
	March	305,000	225,000	HW-36001	4	Transferred 182,000 gallons of concentrated TBP Plant waste from tank 241-B-110 to tank 241-B-107, which cascaded 140,000 gallons of waste to tank 241-B-108.
	April	305,000	225,000	HW-36553	4	Tank 241-B-107 contains 225,000 gallons of 1C/CW sludge and concentrated 1C/CW interstitial liquid and 305,000 gallons of concentrated TBP Plant waste.
	May	305,000	225,000	HW-37143	4	
	June	305,000	225,000	HW-38000	4	
	July	305,000	225,000	HW-38401	4	
	August	305,000	225,000	HW-38926	4	
	September	305,000	225,000	HW-39216	4	
	October	305,000	225,000	HW-39850	4	
	November	305,000	225,000	HW-40208	4	
	December	305,000	225,000	HW-40816	4	
1956	January	305,000	225,000	HW-41038	4	
	February	305,000	275,000	HW-41812	4	Reported sludge volume in tank 241-B-107 appears to be in error, given subsequent reported sludge volume.
	March	305,000	225,000	HW-42394	4	
	April	305,000	225,000	HW-42993	4	
	May	305,000	225,000	HW-43490	4	
	June	305,000	225,000	HW-43895	4	
	July	305,000	Not reported	HW-44860	4	
	August	305,000	225,000	HW-45140	4	
	September	305,000	225,000	HW-45738	4	
	October	305,000	225,000	HW-46382	4	
	November	305,000	225,000	HW-47052	4	
	December	305,000	225,000	HW-47460	4	

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1957	January	271,000	225,000	HW-48144	4	Latest electrode reading of waste level in tank 241-B-107.
	February	271,000	225,000	HW-48846	4	
	March	271,000	225,000	HW-49523	4	
	April	271,000	225,000	HW-50127	4	
	May	267,000	230,000	HW-50617	4	Latest electrode reading of waste level in tank 241-B-107.
	June	292,000	230,000	HW-51348	4	New electrode reading of waste level in tank 241-B-107 indicates increase in waste level measurement. No waste transferred into tank.
	July	305,000	230,000	HW-51858	4	Latest electrode reading of waste level in tank 241-B-107.
	August	305,000	230,000	HW-52414	4	
	September	41,000	230,000	HW-52932	4	Transferred 264,000 gallons of supernatant to tank 241-C-101 for processing (scavenging) in 244-CR Vault. Supernatant processed in 244-CR Vault to precipitation Cs-137 and Sr-90 using sodium ferrocyanide and nickel sulfate. Scavenged TBP Plant waste transferred to tanks 241-C-108, 241-C-109, 241-C-111, or 241-C-112 to settle ferrocyanide precipitate. Scavenged TBP Plant supernatant discharged to trenches (HW-83906-C-RD, page 80).
	October	0	261,000	HW-53573	4	Waste inventory in tank 241-B-107 reported as sludge.
	November	0	261,000	HW-54067	4	
	December	0	261,000	HW-54519	4	
1958	January	13,000	261,000	HW-54916	4	Latest electrode reading of waste level in tank 241-B-107.
	February	13,000	261,000	HW-55264	4	
	March	13,000	261,000	HW-55630	4	
	April	10,000	261,000	HW-55997	4	Latest electrode reading of waste level in tank 241-B-107.
	May	10,000	261,000	HW-56357	4	
	June	10,000	261,000	HW-56761	4	
	July	10,000	261,000	HW-57122	4	
	August	10,000	261,000	HW-57550	4	
	September	10,000	261,000	HW-57711	4	
	October	10,000	261,000	HW-58201	4	
	November	10,000	261,000	HW-58579	4	
	December	10,000	261,000	HW-58831	4	

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1959	January	10,000	261,000	HW-59204	4	
	February	10,000	261,000	HW-59586	4	
	March	10,000	261,000	HW-60065	4	
	April	10,000	261,000	HW-60419	4	
	May	10,000	261,000	HW-60738	4	
	June	10,000	261,000	HW-61095	4	
	July	10,000	261,000	HW-61582	4	
	August	10,000	261,000	HW-61952	4	
	September	10,000	261,000	HW-62421	4	
	October	10,000	261,000	HW-62723	4	
	November	10,000	261,000	HW-63083	4	
	December	10,000	261,000	HW-63559	4	
1960	January	10,000	261,000	HW-63896	4	
	February	10,000	261,000	HW-64373	4	
	March	10,000	261,000	HW-64810	4	
	April	10,000	261,000	HW-65272	4	
	May	10,000	261,000	HW-65643	4	
	June	10,000	261,000	HW-66187	4	
	July	10,000	261,000	HW-66557	4	
	August	10,000	261,000	HW-66827	4	
	September	10,000	261,000	HW-67696	4	
	October	10,000	261,000	HW-67705	4	
	November	10,000	261,000	HW-68291	4	
	December	12,000	225,000	HW-68292	4	Corrected tank waste volume. Previous readings of tank waste level were incorrect.
1961	January through June	8,000	261,000	HW-71610	4	
	July through December	10,000	261,000	HW-72625	4	Latest electrode reading of waste level in tank 241-B-107.
1962	January through June	10,000	261,000	HW-74647	4	
	July through December	10,000	261,000	HW-76223	4	
1963	January through June	0	271,000	HW-78279	4	
	July through December	264,000	271,000	HW-80379	4	Transferred 264,000 gallons of PUREX coating removal waste from tank 241-C-102 into tank 241-B-107.

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1964	January through June	264,000	271,000	HW-83308	4	
	July through December	270,000	271,000	RL-SEP-260	4	Latest electrode reading of waste level in tank 241-B-107.
1965	January through June	347,000	202,000	RL-SEP-659	4	New electrode reading.
	July through September	347,000	202,000	RL-SEP-821	4	
	October through December	344,000	202,000	RL-SEP-923	4	
1966	January through March	341,000	202,000	ISO-226	4	
	April through June	341,000	202,000	ISO-404	4	
	July through September	339,000	202,000	ISO-538	4	
	October through December	339,000	202,000	ISO-674	4	
1967	January through March	336,000	202,000	ISO-806	4	
	April through June	333,000	202,000	ISO-967	4	
	July through September	333,000	202,000	ARH-95	5	
	October through December	333,000	202,000	ARH-326	5	
1968	January through March	329,000	202,000	ARH-534	5	
	April through June	328,000	202,000	ARH-721	5	
	July through September	328,000	202,000	ARH-871	5	
	October through December	326,000	202,000	ARH-1061	5	
1969	January through March	326,000	202,000	ARH-1200 A	5	
	April through June	325,000	202,000	ARH-1200 B	5	
	July through September	0	200,000	ARH-1200 C	5	Transferred 327,000 gallons of waste from tank 241-B-107 to tank 241-B-103, which was then transferred to tank 241-BY-103 for feed to In Tank Solidification (ITS) unit number 1.
	October through December	0	200,000	ARH-1200 D	5	
1970	January through March	0	200,000	ARH-1666 A	5	
	April through June	0	200,000	ARH-1666 B	5	
	July through September	0	200,000	ARH-1666 C	5	
	October through December	0	200,000	ARH-1666 D	5	

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1971	January through March	0	200,000	ARH-2074 A	5	
	April through June	0	200,000	ARH-2074 B	5	
	July through September	0	200,000	ARH-2074 C	5	
	October through December	0	200,000	ARH-2074 D	5	
1972	January through March	0	200,000	ARH-2456 A	4	
	April through June	0	193,000	ARH-2456 B	4	Saltwell pump installed in May 1972 (60410-78-092). Added 2,000 gallons of flush water to tank 241-B-107. Transferred 18,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	July through September	0	193,000	ARH-2456 C	4	
	October through December	0	193,000	ARH-2456 D	4	
1973	January through March	0	193,000	ARH-2794 A	4	Transferred 2,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	April through June	0	193,000	ARH-2974 B	4	Transferred 1,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	July through September	0	193,000	ARH-2974 C	4	
	October through December	0	193,000	ARH-2974 D	4	Identified tank 241-B-107 as questionable integrity.
1974	January through March	0	193,000	ARH-CD-133 A	4	
	April through June	0	193,000	ARH-CD-133 B	4	Transferred 4,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	July through September	0	193,000	ARH-CD-133 C	4	Transferred 6,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	October through December	0	194,000	ARH-CD-133 D	4	Added 4,000 gallons of water to tank 241-B-107. Transferred 7,000 gallons of waste from tank 241-B-107 to tank 241-B-102.

Table A-1. VOLUME OF WASTE IN TANKS 241-B-107

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments
1975	January through March	0	194,000	ARH-CD-336 A	4	Transferred 1,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	April through June	0	194,000	ARH-CD-336 B	4	Tank 241-B-107 removed from service. Transferred 3,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	July through September	0	194,000	ARH-CD-336 C	4	Transferred 3,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	October through December	0	194,000	ARH-CD-336 D	4	Transferred 3,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
1976	January through March	0	194,000	ARH-CD-702 A	4	
	April through June	0	194,000	ARH-CD-702 B	4	Transferred 1,000 gallons of waste from tank 241-B-107 to tank 241-B-102.
	September	0	194,000	ARH-CD-702 I	7 & 28	Solids level measurement last obtained on June 30, 1972.
	October	0	194,000	ARH-CD-822-OCT	8	
	November	0	194,000	ARH-CD-822-NOV	8	
	December	0	194,000	ARH-CD-822-DEC	10	
1977	January	0	194,000	ARH-CD-822-JAN	10	
	February	0	194,000	ARH-CD-822-FEB	10	
	March	0	194,000	ARH-CD-822-MAR	10	
	April	0	194,000	ARH-CD-822-APR	10	
	May	0	194,000	ARH-CD-822-MAY	10	
1978	April	0	194,000	60410-78-092		A total of 41,500 gallons of waste were saltwell pumped from tank 241-B-107 to tank 241-B-102 from May 1972 through January 1978.

A1.0 REFERENCES

60410-78-092, 1978, Summary of Salt Well Pumping Status for the Period Ending April 30, 1978, (internal letter from D. R. Autery to J. W. Bailey, May 17), Rockwell Hanford Operations, Richland, Washington.

ARH-95, 1967, *Chemical Processing Division Waste Status Summary, July to September*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary April 1, 1968 through June 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary July 1, 1968 through September 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary October 1, 1968 through December 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 A, 1969, *Chemical Processing Division Waste Status Summary January 1, 1969 through March 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary April 1, 1969 through June 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, 1970, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary July 1, 1973 through September 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 A, 1976, *Production and Waste Management Division Waste Status Summary January 1, 1976 through March 31, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 B, 1976, *Production and Waste Management Division Waste Status Summary April 1, 1976 through June 30, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 I, 1976, *Production and Waste Management Division Waste Status Summary September 30, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-OCT, 1976, *Production and Waste Management D0ivision Waste Status Summary October 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-NOV, 1976, *Production and Waste Management Division Waste Status Summary November 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-DEC, 1976, *Production and Waste Management Division Waste Status Summary December 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-JAN, 1977, *Production and Waste Management Division Waste Status Summary January 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-FEB, 1977, *Production and Waste Management Division Waste Status Summary February 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAR, 1977, *Production and Waste Management Division Waste Status Summary March 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-APR, 1977, *Production and Waste Management Division Waste Status Summary April 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAY, 1977, *Production and Waste Management Division Waste Status Summary May 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1946,*Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.

HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.

HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.

HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.

HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, General Electric Company, Richland, Washington.

HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.

HW-1550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.

HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.

HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-23437-DEL, 1952, *Hanford Works Monthly Report for January 1952*, General Electric Company, Richland, Washington.

HW-23698-DEL, 1952, *Hanford Works Monthly Report for February 1952*, General Electric Company, Richland, Washington.

HW-23982-DEL, 1952, *Hanford Works Monthly Report for March 1952*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953,* General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*, General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section,* Planning and Scheduling, Separations - Operations, *May 31, 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations – Operations, June 30, 1953,* General Electric Company, Richland, Washington.

HW-29054, 1953, Waste-Status Summary, Separations Section Planning and Scheduling, Separations, July 31, 1953, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, August 31, 1953*, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, September 30, 1953*, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, October 31, 1953*, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW-31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, February 1954*, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, April 30, 1954*, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington

HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.

HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations – Engineering and Control, July 31, 1954*, General Electric Company, Richland, Washington

HW-33002, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Projects and Personnel Development Sub-section, August 31, 1954*, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, September 31, 1954*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, November 30, 1954*, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, December 31, 1954*, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1955*, General Electric Company, Richland, Washington.

HW-35628, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1955*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 1955*, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1955*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1955*, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1955*, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, September 30, 1955*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, October 1955*, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, November 30, 1955*, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, December 31, 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1956,* General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1956*, General Electric Company, Richland, Washington.

HW-42394, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1956*, General Electric Company, Richland, Washington.

HW-42993, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1956*, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 31, 1956*, General Electric Company, Richland, Washington.

HW-43895, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1956*, General Electric Company, Richland, Washington.

HW-44860, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1956*,General Electric Company, Richland, Washington.

HW-45140, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1956*, General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department, Production Operation – Chemical Processing Department, September 30, 1956*, General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, October 1956*, General Electric Company, Richland, Washington.

HW-47052, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling Production Operation, November 30, 1956*, General Electric Company, Richland, Washington.

HW-47640, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, December 31, 1956*, General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, January 31, 1957*, Hanford Atomic Products, Richland, Washington.

HW-48846, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, February 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-49523, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, March 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, April 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50617, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, May 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51348, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, June 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54067, 1957, *Waste- Status Summary; Chemical Processing Department, November 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54519, 1958, *Waste- Status Summary; Chemical Processing Department, December 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54916, 1958, *Waste- Status Summary; Chemical Processing Department, January 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55264, 1958, *Waste- Status Summary; Chemical Processing Department, February 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55630, 1958, *Waste- Status Summary; Chemical Processing Department, March 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55997, 1958, *Waste- Status Summary; Chemical Processing Department, April 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56357, 1958, *Waste- Status Summary; Chemical Processing Department, May 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56761, 1958, *Waste- Status Summary; Chemical Processing Department, June 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57122, 1958, *Waste- Status Summary; Chemical Processing Department, July 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57550, 1958, *Waste- Status Summary; Chemical Processing Department, August 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57711, 1958, *Waste- Status Summary; Chemical Processing Department, September 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58201, 1958, *Waste- Status Summary; Chemical Processing Department, October 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58579, 1958, *Waste- Status Summary; Chemical Processing Department, November 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58831, 1959, *Waste- Status Summary; Chemical Processing Department, December 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-59204, 1959, *Waste- Status Summary; Chemical Processing Department, January 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-59586, 1959, *Waste- Status Summary; Chemical Processing Department, February 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60065, 1959, *Waste- Status Summary; Chemical Processing Department, March 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60419, 1959, *Waste- Status Summary; Chemical Processing Department, April 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60738, 1959, *Waste- Status Summary; Chemical Processing Department, May 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61095, 1959, *Waste- Status Summary; Chemical Processing Department, June 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61582, 1959, *Waste- Status Summary; Chemical Processing Department, July 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department, August 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department, September 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department, October 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department, November 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department, December 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63896, 1960, *Chemical Processing Department – Waste Status Summary, January 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64373, 1960, *Chemical Processing Department – Waste Status Summary, February 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65272, 1960, *Chemical Processing Department – Waste Status Summary, April 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-66187, 1960*Chemical Processing Department – Waste Status Summary, June 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66557, 1960, *Chemical Processing Department – Waste Status Summary, July 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66827, 1960, *Chemical Processing Department – Waste Status Summary, August 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67696, 1960, *Chemical Processing Department – Waste Status Summary, September 1960*, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-67705, 1960, *Chemical Processing Department – Waste Status Summary, October 1960*, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-68291, 1961, *Chemical Processing Department – Waste Status Summary, November 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68292, 1961, *Chemical Processing Department – Waste Status Summary, December 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-71610, 1961, *Chemical Processing Department – Waste Status Summary, January - June 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, July – December 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department – Waste Status Summary,Planning and Scheduling Production Operation, January – June 1962*, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-78279, 1963, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January - June 1963*,Hanford Atomic Products Operation, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-83308, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January – June 1964*, Hanford Atomic Products Operation, Richland, Washington.

HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.

ISO-226, 1966, *Chemical Processing Division – Waste Status Summary January 1, 1966 through March 31, 1966*, ISOCHEM INC., Richland, Washington.

ISO-404, 1966, *Chemical Processing Division – Waste Status Summary April 1, 1966 through June 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 through September 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary October 1, 1966 – December 31, 1966*, Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary January 1, 1967 Through March 31, 1967*, ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary April 1, 1967 Through June 30, 1967,* ISOCHEM INC., Richland, Washington.

RL-SEP-260, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1964 Through December 31, 1964*, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Hanford Atomic Products Operation, Richland, Washington.

Station 48
MAY 02 2003
S

ENGINEERING DATA TRANSMITTAL

1. EDT 624106

2. To: (Receiving Organization) Waste Disposal Strategic Planning	3. From: (Originating Organization) Process Engineering	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Supplemental Treatment	6. Design Authority/Design Agent/Cog. Engr.:	7. Purchase Order No.: N/A
8. Originator Remarks: This document describes the different types of waste that were transferred into and removed from single-shell tanks 241-B-110 and 241-B-111.		9. Equip./Component No.: N/A 10. System/Bldg./Facility: N/A 12. Major Assm. Dwg. No.: N/A
11. Receiver Remarks:	11A. Design Baseline Document? ☐ Yes ☒ No	13. Permit/Permit Application No.: N/A 14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	RPP-16015	N/A	0	Origin of Wastes in Single-Shell Tanks 241-B-110 and 241-B-111	N/A	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D OR N/A (See WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Authority				1	1	K. D. Boomer	K. D. Boomer	4/29/03	
		Design Agent									
1	1	Cog. Eng. M. E. Johnson	M E Johnson	4/29/03							
1	1	Cog. Mgr. S. M. Mackay	S Mackay	4/29/03							
		QA									
		Safety									
		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
Michael E. Johnson M. E. Johnson 4/29/03 Signature of EDT Originator / Date	J. Kristofzski Authorized Representative for Receiving Organization / Date	S Mackay S. M. Mackay 4/29/03 Design Authority/ Cognizant Manager / Date	Ctrl No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	M. E. Johnson	Date 04/29/03
Project Title/Work Order		EDT No. 624106
Origin of Wastes in Single-Shell Tanks 241-B-110 and 241-B-111		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
K. D. Boomer	L4-07	x			
D. W. Cras	L4-07	x			
B. A. Higley	R3-73	x			
M. E. Johnson	L4-07	x			
J. G. Kristofzski	H6-03	x			
S. M. Mackay	L4-07	x			
D. E. Place	R3-73	x			
R. E. Raymond	H6-22	x			
A. Tedeschi	H6-22	x			
T. M. Horner	S5-13	x			
N. W. Kirch	R3-73	x			

Origin of Wastes in Single-Shell Tanks 241-B-110 and 241-B-111

Michael E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 624106
Cost Center:
B&R Code:

UC:
Charge Code: 501546
Total Pages: 97

Key Words: Hanford, single-shell tank, B-110, B-111
second decontamination cycle (2C) waste, fission product processing waste, B Plant

Abstract: A review of waste transfer documents was conducted to identify the origin of wastes present in tanks B-110 and B-111. These tanks initially received second decontamination cycle (2C) waste from the 221-B Bismuth Phosphate Plant, which separated into 2C sludge and supernatant. The supernatant was discharged to cribs. 242-B Evaporator bottoms were briefly stored in these tanks. Later, these tanks received waste from fission product separations conducted at the 221-B Plant.

5/2/03

Release Approval   Date

DATE: MAY 02 2003
HANFORD RELEASE
STA: 4
ID: 8

Release Stamp

Approved For Public Release

RPP-16015
Revision 0

ORIGIN OF WASTES IN SINGLE-SHELL TANKS 241-B-110 AND 241-B-111

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
April 2003

CH2MHILL
Hanford Group, Inc.
Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

Approved for public release; distribution unlimited

This page intentionally left blank.

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tanks 241-B-110 and 241-B-111. This review was conducted to support decisions concerning disposition of the waste present in tanks 241-B-110 and 241-B-111.

These two tanks were operated for a number of years in a cascade along with tank 241-B-112. Waste was transferred into tank 241-B-110 and when this tank was filled, waste overflowed through an underground pipeline into tank 241-B-111. Similarly, when tank 241-B-111 was filled, waste overflowed through an underground pipeline into tank 241-B-112. In 1947, piping modifications were conducted which allowed waste to be transferred directly into any one of these three tanks. The wastes transferred into tanks 241-B-110, 241-B-111, and 241-B-112 are summarized in Table ES-1. Tanks 241-B-110, 241-B-111, and 241-B-112 generally received waste from operations conducted in the 221-B Plant.

Tanks 241-B-110, 241-B-111, and 241-B-112 received second decontamination cycle (2C) waste from spent nuclear fuel reprocessing (Bismuth Phosphate process) conducted in the 221-B Plant from May 1945 through June 1952. Low-activity cell drainage (5-6) waste was also transferred from B-Plant into these three tanks from June 1951 through June 1952. After cessation of the Bismuth Phosphate process in June 1952, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from cleanout of B-Plant from July 1952 through September 1954. The 2C, 5-6, and equipment cleaning wastes were purposely precipitated in tanks 241-B-110 and 241-B-111 to separate transuranic elements (primarily plutonium and americium), with supernatant cascading into tank 241-B-112. The soluble fractions of these wastes were transferred from tank 241-B-112 to an underground crib.

Following the shutdown of B-Plant, tanks 241-B-110 and 241-B-111 received evaporator bottoms from the 242-B Evaporator in April 1954. The evaporator bottoms waste was subsequently transferred to other single-shell tanks as part of plans to reactivate B-Plant. Reactivation of B-Plant for spent nuclear fuel reprocessing was conducted from October 1955 through March 1957. Equipment and process cells were flushed as part of these reactivation activities. These flush solutions were routed to tanks 241-B-110, 241-B-111, and 241-B-112, with the supernatant discharged from tank 241-B-112 to an underground crib. Plans to reactivate B-Plant for spent fuel reprocessing were cancelled in March 1957 and the plant was idled.

B-Plant was then reactivated for separating fission products (e.g., strontium-90, rare earth elements, and cesium-137) from plutonium-uranium extraction (PUREX) high-level waste and stored tank wastes. From September 1961 through June 1970, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from construction activities conducted at B-Plant, strontium and rare earth (Sr/RE) elements separations, cell 23 evaporator bottoms, and cesium ion exchange processing. Tank 241-B-112 also received from January 1973 through June 1974 evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

The Sr/RE waste, cell 23 evaporator bottoms, and cesium ion exchange process wastes were all transferred from tanks 241-B-110 and 241-B-111 to other single-shell tanks from 1965 through March 1972. Following these transfers, tanks 241-B-110 and 241-B-111 contained principally sludges formed from precipitation of the 2C waste and the Sr/RE waste, along with precipitated salts from the B-Plant cesium ion exchange waste. Tank 241-B-112 did not receive a measurable quantity of 2C sludge based on the cascade operating mode and sludge level measurements, but instead contains precipitated salts from B-Plant cesium ion exchange waste and evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

Table ES-1. Waste Types Added to Tanks 241-B-110, 241-B-111, and 241-B-112.

Waste Type [1]	Tank 241-B-110	241-B-111	241-B-112
2C [2]	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951
2C + 5-6	6/1951 – 7/1952	6/1951 – 7/1952	6/1951 – 7/1952
B-Plant Equipment Cleaning Waste	7/1952 – 9/1954	7/1952 – 9/1954	7/1952 – 9/1954
EB from 242-B Evaporator	4/1954	4/1954	In advertent addition of some EB to this tank
B-Plant Reactivation for 4X Program (cancelled in 3/1957)	10/1955 – 4/1957	10/1955 – 4/1957	Not added to tank
B-Plant Construction for Sr/RE Process	9/1961 – 12/1962	9/1961 – 12/1962	9/1961 – 12/1962
B-Plant Sr/RE Processing	8/1963 – 6/1966	8/1963 – 6/1966	8/1963 – 6/1966
B-Plant equipment flushing	7/1966 – 1Q/1968	7/1966 – 10/1967	7/1966 – 10/1967
EB from B-Plant Cell 23 evaporator	1Q/1968	10/1967	Not added to tank
B-Plant IX	3Q/1969	3Q/1969 – 2Q/1970	3Q/1969 – 2Q/1970
EB from ITS	Not added to tank	Not added to tank	1/1973 – 6/1974

Notes:

(1) Waste Type Definitions:

2C: Second decontamination cycle waste from B-Plant Bismuth Phosphate process
5-6: B-Plant low activity cell drainage
EB: Evaporator bottoms
ITS: In-Tank Solidification unit installed in tank 241-BY-112
IX: waste from B-Plant cesium ion exchange process
Q: calendar year quarter
Sr/RE: Strontium / Rare Earths

(2) 2C waste routed to tanks 241-B-104, 241-B-105, and 241-B-106 during period when tanks 241-B-110, 241-B-111, and 241-B-112 were filled.

CONTENTS

1.0 INTRODUCTION 9

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANKS 241-B-110, 241-B-111, AND 241-B-112 9
- 2.1 Description of Tanks 241-B-110, 241-B-111, and 241-B-112 9
- 2.2 Waste Transfers for Tanks 241-B-110, 241-B-111, and 241-B-112 11
  - 2.2.1 Second Decontamination Cycle (2C) Waste 11
  - 2.2.2 2C Waste Combined with Cell Drainage (5-6) Waste 13
  - 2.2.3 221-B Equipment Cleaning Waste 14
  - 2.2.4 242-B Evaporator Bottoms Receipt into Tanks 241-B-110 and 241-B-111 14
  - 2.2.5 Waste from Preparations to Re-Activate 221-B Plant 15
  - 2.2.6 Cesium and Strontium Scavenging of Supernatant 16
  - 2.2.7 221-B Plant Strontium and Rare Earth Processing Waste 16
  - 2.2.8 221-B Plant Cell 23 Evaporator Bottoms Waste 17
  - 2.2.9 221-B Plant Cesium Ion Exchange Process Waste 18
  - 2.2.10 Removal of Pumpable Liquids from Tanks 241-B-110 and 241-B-111 19
  - 2.2.11 Comparison with Other Reports 20

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 21
- 3.1 B AND T BISMUTH PHOSPHATE PROCESS PLANTS 21
  - 3.1.1 221-B Cell Drainage (5-6) Waste 27
- 3.2 221-B PLANT FISSION PRODUCTS PROCESSING 30
  - 3.2.1 STRONTIUM AND RARE EARTHS PROCESSING 30
  - 3.2.2 CESIUM AND STRONTIUM PROCESSING 31

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANKS 241-B-110 AND 241-B-111 33

5.0 SUMMARY 34

6.0 REFERENCES 36

APPENDIX

A. Volume of Wastes in Tanks 241-B-110, 241-B-111, and 241-B-112 ..... A-1

FIGURES

Figure 1. Tanks 241-B-110, 241B-111 and 241-B-112 Waste Tank Cascade System 10
Figure 2. Bismuth Phosphate Process Diagram 23

TABLES

Table 1. Volume of B-Plant Cesium Ion Exchange Waste Transferred to Tanks 241-B-110 and 241-B-111 19
Table 2. Estimated Composition of Bismuth Phosphate Plant Wastes 24
Table 3. Analyses of Bismuth Phosphate Process Supernatants Stored (1,2) 25
Table 4. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant 26
Table 5. Composition of Tank 5-6 Cell Drainage Waste from 221-B Plant. (2 Sheets) 28
Table 6. Concentrations of Radionuclides Present in 33
Table 7. Waste Types Added to Tanks 241-B-110, 241-B-111, and 241-B-112 35

LIST OF TERMS

1C	first cycle of the bismuth phosphate plutonium decontamination process
2C	second cycle of the bismuth phosphate plutonium decontamination process
5-6	low activity cell drainage waste
CAW	Current Acid Waste
cc	cubic centimeters
CW	Coating waste
DOE	U.S. Department of Energy
EB	evaporator bottoms
lbs	pounds
ITS	In-Tank Solidification
IX	Ion Exchange
mL	milliliters
MW	Metal waste
PAS	PUREX Acidified Sludge
PTA	phosphotungstic acid
PUREX	Plutonium Uranium Extraction Plant
REDOX	Reduction-Oxidation Plant
Sr/RE	strontium and rare earth
TBP	Tri-butyl Phosphate
wt%	weight percent
ηCi/g	nanocuries per gram
μCi/cc	microcuries per cubic centimeters
μCi/g	microcuries per gram
μg/cc	micrograms per cubic centimeters

This page intentionally left blank.

1.0 INTRODUCTION

The origin of the wastes in tanks 241-B-110, 241-B-111, and 241-B-112 is important in determining the disposition of these wastes and the waste storage tanks. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tanks 241-B-110, 241-B-111, and 241-B-112. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to the underground storage tanks 241-B-110, 241-B-111, and 241-B-112. Section 4.0 provides a discussion on the radionuclide analyses of the wastes in tanks 241-B-110, 241-B-111, and 241-B-112. Section 5.0 summarizes the waste types that were transferred into tanks 241-B-110, 241-B-111, and 241-B-112.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANKS 241-B-110, 241-B-111, AND 241-B-112

This section provides a brief description of 241-B-110, 241-B-111, and 241-B-112 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the wastes presently stored in tanks 241-B-110, 241-B-111, and 241-B-112, publicly available reports for the Hanford Site were reviewed. With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/ or the U.S. Department of Energy (DOE) Information Bridge at http://www.osti.gov/bridge/. The waste status summary reports are available only as photocopies from Hanford Site Central Files organization.

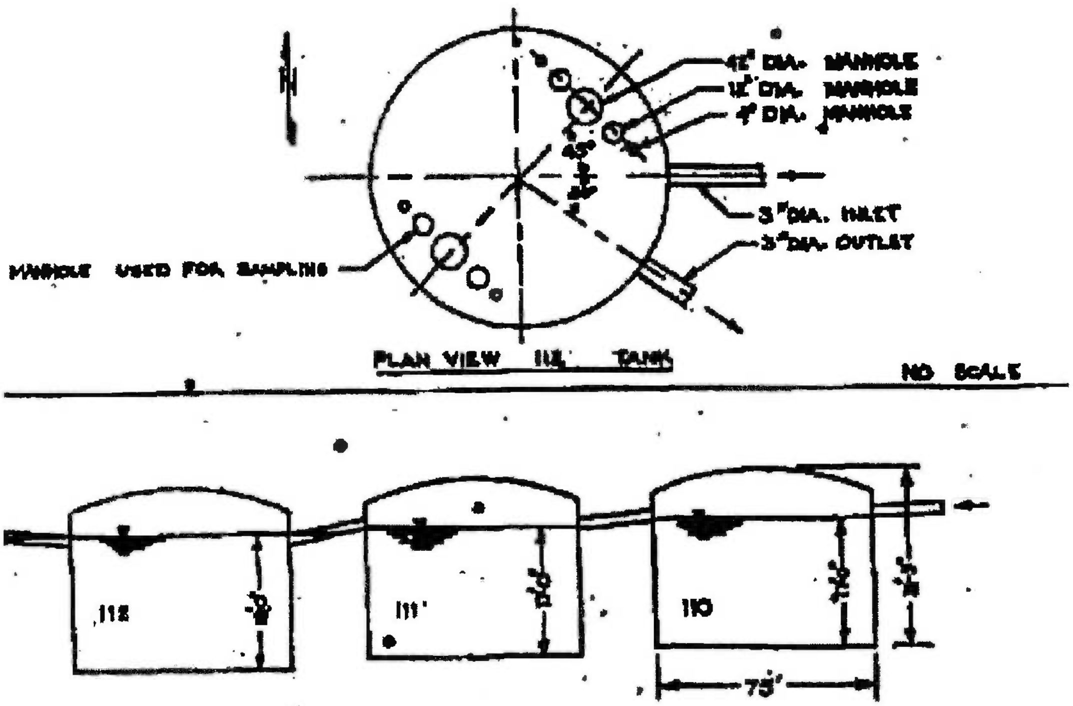
2.1 DESCRIPTION OF TANKS 241-B-110, 241-B-111, AND 241-B-112

Single-shell tanks 241-B-110, 241-B-111, and 241-B-112 were originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX) and are three of the twelve, 100-series tanks in 241-B Tank Farm. The 100-series tanks are seventy-five-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. The steel liner extends to a height of nineteen feet. Each 100-series tank has a design capacity of 530,000 gallons at a liquid depth of sixteen-feet and eight-inches. The 241-B Tank Farm also includes four 200-series tanks that are of similar construction as the 100-series tanks, but are only twenty-foot diameter and each have a capacity of 55,000-gallons.

Tanks 241-B-110 and 241-B-111, along with tank 241-B-112, were connected together via underground piping to allow waste to cascade from the lead tank into the subsequent two tanks, as depicted in Figure 1. As discussed in subsequent sections, waste was discharged from these tanks through an underground pipeline to a crib for a number of years. In addition to the overflow piping, each tank is equipped with four, 3-inch diameter stainless steel inlet pipes. Originally, only the inlet pipes from tank 241-B-110 were connected to diversion box 241-B-153, with the inlet pipes for the other tanks blanked off close to each tank (HW-10475-C, page 907 –908). However, in 1947, piping modifications were conducted to allow the direct transfer of waste from diversion box 241-B-153 to any of these three tanks (H-2-579 and HAN-45764, page 39).

The overflow pipe for tanks 241-B-110 and 241-B-111 is at an elevation that results in seventeen-feet of waste (~540,530 gallons) being retained in each tank. The overflow pipeline from tank 241-B-112 is at an elevation that results in eighteen-feet of waste (~573,530 gallons) being retained in this tank (HW-27035).

Figure 1. Tanks 241-B-110, 241B-111 and 241-B-112 Waste Tank Cascade System



2.2 WASTE TRANSFERS FOR TANKS 241-B-110, 241-B-111, AND 241-B-112

Tanks 241-B-110, 241-B-111, and 241-B-112 were operated as a cascade from May 1945 through June 1956. Piping modifications made in 1947 also allowed waste to be transferred directly into any of these three tanks. The design of the tank cascade system as shown in Figure 1 resulted in tanks 241-B-110 and 241-B-111 being constantly filled with waste that then cascaded into tank 241-B-112. From February 1948 through July 1953 (HW-33591, page 9), supernatant was periodically transferred from tank 241-B-112 to an underground crib, number 241-B-3. Crib number 241-B-3 was later re-numbered to crib 216-B-8 (HW-55176, Part VI, page 4). From December 1954 through October 1955, supernatant was periodically transferred from tank 241-B-112 to underground cribs number 241-B-1 and 241-B-2 (HW-44784, page 27). Crib numbers 241-B-1 and 241-B-2 were later renumbered to cribs 216-B-7a and 216-B-7b (HW-55176, Part VI, page 4). After October 1955, tank 241-B-112 no longer discharged supernatant to an underground crib.

The volume and radioactive content (plutonium, gross beta, and uranium) of waste discharged from these tanks to underground cribs is summarized in references HW-17088, HW-20583, HW-25301, HW-28121, HW-33591, HW-38562, and HW-44784. Appendix A provides a tabular listing of the volume of solids and total waste present in tanks 241-B-110, 241-B-111, and 241-B-112 from January 1945 through September 1976. All three tanks were removed from service in the 1970's and are assumed to have leaked waste to the surrounding soil.

The following sections describe in chronological order the waste types that were transferred into tanks 241-B-110, 241-B-111, and 241-B-112 along with the disposition of these wastes.

2.2.1 Second Decontamination Cycle (2C) Waste

The 241-B Tank Farm was originally constructed to receive waste from the 221-B Bismuth Phosphate plant (see Section 3.0). Tanks 241-B-110, 241-B-111, and 241-B-112 were operated as a cascade, with second decontamination cycle (designated as 2C) waste from the 221-B building being received into tank 241-B-110. Irradiated fuel was first processed in 221-B Plant beginning on April 13, 1945 (HW-7-1649-DEL, page 21) and 2C waste was reported as beginning to fill tank 241-B-110 in May 1945 (HW-7-1793-DEL, page 22).

Tanks 241-B-110, 241-B-111, and 241-B-112 continued to receive 2C waste through August 15, 1946, at which time these tanks were reported as being filled and 2C waste was diverted to tanks 241-B-104, 241-B-105, and 241-B-106 (HAN-45800-DEL, page 73 and HW-7-4739-DEL, page 21). While tanks 241-B-110, 241-B-111, and 241-B-112 remained filled with 2C waste, tanks 241-B-104, 241-B-105, and 241-B-106 continued to receive 2C waste from irradiated fuel reprocessing activities conducted at the 221-B Plant.

Plans were initiated in October 1946 to dispose of the 2C supernatant contained in these tanks to an underground crib (HW-7-5362-DEL, page 27). A new underground crib (designated as 241-B-3) was constructed in 1947. Tank 241-B-110 would be used to settle solids that formed in the 2C waste, with the supernatant cascading by gravity flow into tank 241-B-111 and then into tank 241-B-112. The clarified 2C supernatant would be jetted from tank 241-B-112 to the underground crib. Crib disposal of the clarified 2C supernatant was authorized on an experimental basis (HW-10321). Approximately 39,000-gallons of 2C waste contained in tank 241-B-112 was jetted to this underground crib in February 1948 (HW-9191-DEL, page 28), but had to be stopped when liquid entered the test shaft adjacent to the crib via connecting lateral pipes. This situation was corrected by sealing the lateral pipes that penetrated into the crib (HAN-45807-DEL, page 29).

Following extensive sampling of the soil beneath the crib (HW-9595-DEL, page 30), crib disposal of additional 2C supernatant from tank 241-B-112 was resumed in March 1948. By the end of April 1948, a total of 314,000-gallons of supernatant were discharged from tank 241-B-112 to crib 241-B-3 (HW-9922-DEL, page 31). All of the 2C supernatant was emptied from tank 241-B-112 on May 13, 1948 (HW-10166-DEL, page 31). Further disposal of 2C supernatant to the crib was halted while extensive soil samples were collected and analyzed to determine the movement of radioactivity in the soil.

The 221-B Plant continued to discharge 2C waste to tanks 241-B-104, 241-B-105, and 241-B-106 from August 1946 through May 14, 1948, at which time this cascade of three single-shell tanks was reported as being filled (HW-10166-DEL, page 31). Beginning on May 14, 1948, the 2C waste from the 221-B Plant was again collected in the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, while efforts were conducted to remove the 2C supernatant from the cascade of tanks 241-B-104, 241-B-105, and 241-B-106.

Approximately 314,000-gallons of the 2C waste present in tank 241-B-104 were jetted to crib 241-B-3 from July through August 2, 1948 (HW-10714-DEL, page 32 and HW-10993-DEL, page 35). Disposal of the 2C waste from tank 241-B-104 had to be halted when personnel determined that 2C sludge was also being jetted along with the supernatant to the crib, causing restricted flow from the crib. In September 1948, jetting of the 2C supernatant present in tank 241-B-105 to crib 241-B-3 was initiated (HW-11226-DEL, page 32). However, the flow of supernatant from the crib was observed to be restricted. Personnel discharged several batches of 10-wt% nitric acid solution to crib 241-B-3 in an attempt to dissolve the solids that were thought to be causing the restricted flow of supernatant from the crib to the soil. However, these acid flushes did not improve the discharge rate of liquid from the crib to the soil. Crib disposal of the 2C supernatant from tank 241-B-105 was completed on December 8, 1948, with a total of 522,800-gallons of waste discharged from this tank into the crib (HW-12086-DEL, page 37). Disposal of the 2C supernatant present in tank 241-B-106 to crib 241-B-3 was initiated on December 14, 1948 (HW-12086-DEL, page 37) and completed during February 1949, with 531,250-gallons of waste discharged to the crib (HW-12666-DEL, page 34).

The cascade of tanks 241-B-110, 241-B-111, and 241-B-112 was again reported as being filled with 2C waste in January 1949 (HW-12391-DEL, page 39). With these tanks filled, 2C waste was again routed from the 221-B Plant into the cascade of tanks 241-B-104, 241-B-105, and

241-B-106. These tanks received 2C waste from February 1949 through April 1950 (HW-17660-DEL, page 46). Disposal of 2C supernatant from tanks 241-B-104, 241-B-105, and 241-B-106 to crib 241-B-3 was conducted from April 1950 (HW-17660-DEL, page 46) through June 1950 (HW-18221-DEL, page 43).

Disposal of 2C supernatant from tank 241-B-112 to crib 241-B-3 was initiated in December 1949 (HW-15550-DEL, page 42) and completed in February 1950, with a total of 497,000-gallons of supernatant disposed (HW-17056-DEL, page 44). Disposal of 2C supernatant from tank 241-B-110 to crib 241-B-3 was initiated in April 1950 (HW-17660-DEL, page 46) and completed in May 1950 (HW-17971-DEL, page 44).

The cascade of tanks 241-B-110, 241-B-111, and 241-B-112 was again reported as receiving 2C waste from the 221-B Plant in May 1950 (HW-17971-DEL, page 44). Disposal of 2C supernatant from tank 241-B-112 to crib 241-B-3 was resumed in October 1950 (HW-19325-DEL, page 49). The 2C waste formed solids, which tended to settle primarily in tank 241-B-110. Some 2C solids also formed in tank 241-B-111. The 2C supernatant overflowed by gravity from tank 241-B-110 into tank 241-B-111 and then into tank 241-B-112. The clarified 2C supernatant was periodically jetted from tank 241-B-112 to the crib through April 1951 (HW-20991-DEL, page 51). Modification to the discharge from tank 241-B-112 was conducted in May and June 1951 to allow the clarified 2C supernatant to overflow from tank 241-B-112 into the crib (H-2-1984 and HW-21506-DEL, page 56). As discussed in the next section, the cascade began to receive a combined waste stream.

2.2.2 2C Waste Combined with Cell Drainage (5-6) Waste

Beginning in June 1951, the neutralized, cell drainage waste from the 221-B Plant (designated as 5-6 waste) was combined with the 2C waste in the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (H-2-1991 and HW-21506-DEL, page 56). Tank 5-6 in the 221-B Plant was used to collect low-activity drainage from the process cells. The radionuclide content of cell drainage waste depended on the frequency of leaks that developed in the 221-B Plant process equipment. High-activity cell drainage waste was collected in tank 5-9 and either reworked or transferred to single-shell tank 241-B-107 (see Section 3.1.1).

The low-activity cell drainage was transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 so "... that the major portion of the suspended plutonium carrying solids will settle out while the waste solution combines and cascades concurrently with the second decontamination cycle waste prior to underground cribbing by constant overflow" (HW-21506-DEL, page 56). The combined 2C waste and cell drainage waste from tank 5-6 were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112. All three tanks were essentially filled with waste to the overflow pipeline. Solids settled by gravity in each tank of the cascade. Supernatant overflowed from tank 241-B-110 to tank 241-B-111, which then overflowed to tank 241-B-112. Supernatant overflowed from tank 241-B-112 to the crib. The combined disposal of low-activity cell drainage waste and 2C waste to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 continued until July 1952 (HW-25227-DEL, pages Ed-5 and Ed-6), after which the 221-B Plant stopped processing irradiated fuel.

2.2.3 221-B Equipment Cleaning Waste

Beginning in July 1952, cleanout of B-Plant and the 224-B Concentration building was initiated, with the irradiated nuclear fuel dissolver heels removed from equipment in the 221-B building (HW-25227-DEL, pages Ed-1 and Ed-6). The process equipment in B-Plant was flushed with nitric acid solution from July 1952 through September 1952 to remove plutonium. The recovered plutonium solutions were processed through the normal bismuth phosphate flowsheet (HW-25227-DEL page Ed-1 and Ed-6, HW-25533-DEL, pages Ed-1 and Ed-6, HW-25781-DEL, page Ed-1, and HW-26047-DEL, pages Ed-1 and Ed-5). Plutonium solutions derived from equipment cleanout activities in the 221-B building were processed in the 224-B Concentration building to recover the plutonium, with the 2C waste transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (HW-27838 and HW-27839).

Additional cleaning of the internal surfaces of piping and equipment in 221-B and 224-B buildings was conducted using various chemical solutions and water, as described in HW-27774. This cleaning occurred from October 1952 through March 1953.

Flushes of metal waste, first decontamination cycle, and second decontamination cycle equipment were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, as documented in waste status summary reports for the 200 Area tanks farms for this period (HW-27840, HW-27841, HW-27842, and HW-27775).

Flushing of the B-Plant building cells and wetting of process equipment with water was conducted in April 1953 through June 1, 1953 (HW-27932-DEL, page Ed-5; HW-28267-DEL, page Ed-5; and HW-28576-DEL, page Ed-5). These flush solutions were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, as documented in waste status summary reports for the 200 Area tanks farms for this period (HW-28043, HW-28377, and HW-28712). Flushing of the 221-B Plant cells and wetting of equipment was halted in July 1953 (HW-33591, page 9). These tanks again received flush solutions from the 221-B Plant in March 1954 (HW-31374, page 4) through September 1954 (HW-33396, page 4).

2.2.4 242-B Evaporator Bottoms Receipt into Tanks 241-B-110 and 241-B-111

In December 1953, approximately 105,000-gallons of supernatant were transferred from tank 241-B-110 to tank 241-C-111 (HW-30498, page 4). In February 1954 (HW-31126, page 4) and again in April 1954 (HW-31811, page 4 and HW-36979B, page 70), the supernatant present in tanks 241-B-110 and 241-B-111 was transferred to tank 241-B-112 and disposed to the crib. These transfers were made to prepare tanks 241-B-110 and 241-B-111 for receipt of concentrated waste from the 242-B Evaporator.

The 242-B Evaporator processed first decontamination cycle (1C) supernatant that was neutralized with coating removal waste to reduce the volume of waste stored in the single-shell tanks. Evaporator bottoms from the 242-B Evaporator were transferred into tank 241-B-105 and then transferred to tanks 241-B-110 and 241-B-111 in April 1954 (HW-31811, page 4). Tank 241-B-10 received an estimated 155,000-gallons of evaporator bottoms which was mixed with

221-B Plant flush solution and stored atop of the approximately 243,000-gallons of 2C sludge in this tank. Tank 241-B-111 received an estimated 335,000-gallons of evaporator bottoms which was mixed with 221-B Plant flush solution and stored atop of the approximately 161,000-gallons of 2C sludge in this tank.

In March 1955, approximately 182,000-gallons of supernatant (mixture of evaporator bottoms and 221-B Plant flush solution) were transferred from tank 241-B-110 into tanks 241-B-107 and 241-B-108 (HW-36001, page 4). An estimated 348,000-gallons of sludge remained in tank 241-B-110, with no supernatant. This sludge volume measurement implies that 105,000-gallons of evaporator bottoms precipitated atop of the 243,000-gallons of 2C waste present in tank 241-B-110.

In July 1955, approximately 281,000-gallons of supernatant (mixture of evaporator bottoms and 221-B Plant flush solution) were transferred from tank 241-B-111 into tank 241-B-108 (HW-38401, page 4). An estimated 249,000-gallons of sludge remained in tank 241-B-111, with no supernatant. This sludge volume measurement implies that 88,000-gallons of evaporator bottoms precipitated atop of the 161,000-gallons of 2C waste present in tank 241-B-111.

2.2.5 Waste from Preparations to Re-Activate 221-B Plant

In 1955, a program (4X Program) was initiated to operate all four of the chemical separation facilities (i.e. 221-B, 221-T, 202-S Reduction-Oxidation [REDOX], and 202-A Plutonium-Uranium Extraction [PUREX] Plants) for reprocessing irradiated nuclear fuel (HW-35825). The 221-B Plant was to be re-activated as part of this program and maintained in standby status in case the other chemical separation facilities failed to meet production goals.

Flushing of process cells and equipment within the 221-B Plant was again conducted from October 1955 (HW-39850, page 4) through April 1957 (HW-50127, page 4), with the waste solutions routed to tanks 241-B-110 and 241-B-111. Tanks 241-B-110 and 241-B-111 received a total of approximately 187,000-gallons and 105,000-gallons of flush solutions, respectively. The 4X Program was cancelled in March 1957 and the 221-B Plant was placed in lay-away status (DDTS-Generated-491, "Lay-Away of the Bismuth Phosphate – TBP Plants and the Metal Waste Removal Facilities").

These flush solutions apparently dissolved the evaporator bottoms precipitates that were present in tanks 241-B-110 and 241-B-111. In January 1957, the measured volumes of solids present in tanks 241-B-110 and 241-B-111 were 243,000-gallons and 161,000-gallons, respectively (HW-48144, page 4). Before receipt of the 221-B Plant flush solutions, the volume of solids present in tank 241-B-110 was 348,000-gallons, of which 243,000-gallons was previously reported as being 2C sludge (see Section 2.2.4). Before receipt of the 221-B Plant flush solutions, the volume of solids present in tank 241-B-111 was 249,000-gallons, of which 161,000-gallons was previously reported as being 2C sludge (see Section 2.2.4). Therefore, it is surmised that only 2C sludge comprised the solids present in tanks 241-B-110 and 241-B-111 in January 1957.

2.2.6 Cesium and Strontium Scavenging of Supernatant

In October 1956, the waste in tank 241-B-112 was noted as being contaminated with evaporator bottoms (HW-46382, page 4). Evaporator bottoms were likely inadvertently transferred into tank 241-B-112 through the overflow line from tank 241-B-111 during the period of time that tank 241-B-111 was used to store evaporator bottoms (see section 2.2.4).

In October 1957, the approximately 495,000-gallons of the supernatant present in tank 241-B-112 was transferred to tank 241-C-101 (HW-53573, page 4) for precipitation of strontium-90 and cesium-137 as part of the in-tank scavenging program for these radionuclides (HW-38955-REV). The remaining waste present in tank 241-B-112 was approximately 43,000-gallons of sludge.

The 241-B-112 supernatant was transferred from tank 241-C-101 to the 241-CR Vault. In the 241-CR Vault, the supernatant was adjusted to pH 9.3 ± 0.7 by addition of nitric acid solution and then reacted with sodium ferrocyanide and nickel sulfate to precipitate strontium and cesium. The precipitate slurry was transferred to either tank 241-C-109 or 241-C-112 for settling of the nickel ferrocyanide precipitate, which contained the strontium-90 and cesium-137 radionuclides. After settling of the precipitate, the supernatant was pumped from tanks 241-C-109 and 241-C-112 to the 216-BC trenches for disposal (HW-48518, page 19).

As discussed in Section 2.2.4, the evaporator bottoms that were stored in tanks 241-B-110 and 241-B-111 were transferred to tanks 241-B-107 and 241-B-108 and stored with the 1C sludge (see Section 3.1) present in these tanks. The in-tank scavenging program also processed the supernatant stored in tanks 241-B-107 and 241-B-108 in September 1957 (HW-52932, page 4 and HW-83906-C-RD, page 80) in a manner similar to that described above for the tank 241-B-112 supernatant.

2.2.7 221-B Plant Strontium and Rare Earth Processing Waste

From May 1957 through June 1961, tanks 241-B-110, 241-B-111, and 241-B-112 did not receive any waste solutions. The 221-B Plant was in lay-away status, and no waste solutions were transferred to the single-shell tanks.

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within the 221-B Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). These construction activities resulted in the transfer of 81,000-gallons of equipment and facility flush solutions to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 from September 1961 (HW-72625, page 5) through December 1962 (HW-76223, page 4). Between January 1963 and June 1963, the supernatant present in tanks 241-B-110 and 241-B-111 was pumped into tank 241-B-112 in preparation for receipt of waste from B-Plant.

In August 1963, B-Plant began processing a strontium-90 and rare earths fission product (i.e. cerium-144 and promethium-147) solution that had been separated from a high-level waste solution within the PUREX facility (see Section 3.2.2). The strontium and rare earths solution was separated into two solutions, one solution containing strontium-90 and the other solution containing the rare earth fission products. The waste generated from the processing of the strontium and rare earths solutions in B-Plant was transferred into tank 241-B-110 and then pumped to either tank 241-B-111 or 241-B-112 (HW-80379, page 4). The strontium and rare earths waste transferred into these tanks contained precipitated metals (e.g., lead) and radionuclides (e.g., strontium-90) as well as soluble salts.

Waste transfers were periodically made in 1965 from tank 241-B-112 to single-shell tank 241-AX-101 in order to provide space in tanks 241-B-110, 241-B-111, and 241-B-112 to receive B-Plant waste solutions (RL-SEP-659, page 4, RL-SEP-821, page 4, and RL-SEP-923, page 4). Processing of strontium and rare earth solutions within B-Plant continued until June 1966 when processing activities within B-Plant were halted for construction activities (HAN-95105-DEL, page 15). From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level wastes. The equipment flush solutions were also routed to tanks 241-B-110, 241-B-111, and 241-B-112.

2.2.8 221-B Plant Cell 23 Evaporator Bottoms Waste

Supernatant was transferred from tanks 241-B-110 and 241-B-111 into tank 241-B-112 in the fourth quarter (October 1 through December 31) of calendar year 1967 (ARH-326, page 5). On October 31, 1967, supernatant was transferred from tank 241-B-112 to the Cell 23 evaporator in B-Plant for concentration (HAN-98918-DEL, page AIII-3, ARH-326, page 5, and ISO-651-RD, page 300). The supernatant was concentrated and returned to tank 241-B-111 (HAN-99196-DEL, page AIII-3, HAN-99396-DEL, page AIII-3, ARH-326, page 5, and ISO-651-RD, page 300).

In the first quarter of calendar year 1968, the supernatant in tank 241-B-110 was transferred to tank 241-B-112 for concentration in the Cell 23 evaporator in B-Plant (ARH-534, page 5). The supernatant was concentrated and returned to tank 241-B-110 (HAN-99196-DEL, page AIII-3, HAN-99396-DEL, page AIII-3, and ARH-534, page 5).

The Cell 23 evaporator within B-Plant continued to be operated from January 1968 through February 2, 1968 to concentrate supernatant that was contained in tank 241-BX-102 (HAN-99604-DEL, page AIII-3 and ARH-534, page 6), with the concentrated supernatant returned to tanks 241-BX-101and 241-BX-104 (ARH-534, page 6). After February 2, 1968, the Cell 23 evaporator concentrated waste from the cesium ion exchange process conducted in B-Plant (see Section 3.2.3).

2.2.9 221-B Plant Cesium Ion Exchange Process Waste

Supernatant was again transferred from tanks 241-B-110 and 241-B-111 to tank 241-B-112, then to tank 241-B-103 in the second and third quarters of calendar years 1969 (ARH-1200 B, page 5 and ARH-1200 C, page 5). These transfers were conducted to prepare tanks 241-B-110 and 241-B-111 to receive waste from cesium ion exchange process conducted at B-Plant (see Section 3.2.3). The quantities of B-Plant cesium ion exchange waste transferred into tanks 241-B-110 and 241-B-111 are summarized in Table 1. The specific batches of cesium ion exchange waste and estimated cesium-137 content are summarized in Appendix A, Table A-2

Tanks 241-B-110 received 199,000-gallons of waste from the B-Plant cesium ion exchange process from July through September 1969 (ARH-1200 C, page 5). Tank 241-B-111 received 214,000-gallons of waste from the B-Plant cesium ion exchange process from July through September 1969 (ARH-1200 C, page 5). Tank 241-BX-104 also received 611,000-gallons of waste from the B-Plant cesium ion exchange process from July through September 1969 (ARH-1200 C, page 6).

B-Plant process records indicate that thirty cesium ion exchange batches were conducted from July 1, 1969 through September 30, 1969 (ARH-N-82, page 146). These thirty ion exchange batches contained approximately 14.8 million curies of cesium-137 (See Appendix A, Table A-2). B-Plant process records indicate that the amount of cesium-137 separated from these thirty ion exchange batches was 15.9 million curies of cesium-137, with 0.27 million curies of cesium-137 (1.8% of the cesium-137 in the feed) sent to the single-shell tanks (ARH-N-82, pages 146 and 147). The discrepancy in the amounts of cesium-137 in the feed to the ion exchange process and the product is thought to be related to the sampling and analyses system accuracy.

Tank 241-B-111 continued to receive waste from the cesium ion exchange process operating within B-Plant from October 1969 through June 1970 (ARH-1200 D, page 5, ARH-1666 A, page 5 and ARH-1666 B, page 5). No other tanks received B-Plant cesium ion exchange waste during this period. The supernatant in tank 241-B-111 was periodically transferred to other single-shell tanks (241-B-103, 241-B-108, 241-B-109, 241-B-112, and 241-BY-112) while tank 241-B-111 was receiving B-Plant cesium ion exchange waste.

B-Plant process records indicate that forty-four cesium ion exchange batches were conducted from October 1, 1969 through June 30, 1970 (ARH-N-82, page 146 through 149). These ion exchange batches contained approximately 22.8 million curies of cesium-137 (See Appendix A, Table A-2). B-Plant process records indicate that the amount of cesium-137 separated from these forty-four ion exchange batches was 23.2 million curies of cesium-137, with 0.60 million curies of cesium-137 (2.6 percent of the cesium-137 in the feed) sent to the single-shell tank 241-B-111 (ARH-N-82, pages 146 through 149). The discrepancy in the amounts of cesium-137 in the feed to the ion exchange process and the product is thought to be related to the sampling and analyses system accuracy.

Table 1. Volume of B-Plant Cesium Ion Exchange Waste Transferred to Tanks 241-B-110 and 241-B-111.

Year	Month	Reference Document	Page	Tank 241-B-110	Tank 241-B-111
1969	July through September	ARH-1200 C	5	199,000-gallons	214,000-gallons
	October through December	ARH 1200 D	5	None	1,119,000-gallons
1970	January through March	ARH 1666 A	5	None	276,000-gallons
	April through June	ARH 1666 B	5	None	265,000-gallons

2.2.10 Removal of Pumpable Liquids from Tanks 241-B-110 and 241-B-111

From July 1970 through June 1971, no waste was added or removed from tanks 241-B-110, 241-B-111, or 241-B-112 (ARH-1666 C, page 5, ARH-1666 D, page 5, ARH-2074 A, page 5, and ARH-2074 B, page 5).

Between July and September 1971, 223,000-gallons of supernatant was transferred from tank 241-B-110 to tank 241-B-102 (ARH-2074 C, page 5), from tank 241-B-102 to tank 241-TX-101, then to tank 241-TX-118 (ARH-2074 D, page 5), and eventually processing in the 242-T Evaporator (ARH-2074 D, page 8). An estimated 2,000-gallons of supernatant remained in tank 241-B-110 at the end of September 1971.

Tank 241-B-110 received periodic transfers of flush water from July 1972 through March 1973, with the flush water transferred to tank 241-B-102 (ARH-2456 C, page 4, ARH-2456 D, page 4, and ARH-2794 A, page 4). In October 1973, tank 241-B-110 was identified as potentially leaking, but no information on the nature of the leak was provided (ARH-2974 D, page 4). From April 1974 (ARH-CD-133 B, page 4) through April 30, 1978 (60410-78-092), liquid was pumped from tank 241-B-110 into tank 241-B-102 to minimize the potential for additional waste leakage.

Between January and March 1972, 239,000-gallons of supernatant was transferred from tank 241-B-111 to tank 241-B-103 (ARH-2456 A, page 4), from tank 241-B-103 to tank 241-TX-101 (ARH-2456 A, page 5), then to tank 241-TX-118 and eventually processing in the 242-T Evaporator (ARH-2456 A, page 7). Tank 241-B-111 was estimated to contain no supernatant at the end of March 1972.

Between October and December 1971, 490,000-gallons of supernatant was transferred from tank 241-B-112 to tank 241-B-103 (ARH-2074 D, page 5), from tank 241-B-103 to tank 241-TX-101 (ARH-2074 D, page 5), then to tank 241-TX-118 and eventually processing in the 242-T Evaporator (ARH-2074 D, page 8). An estimated 50,000-gallons of supernatant remained in tank 241-B-112 at the end of December 1971. Tank 241-B-112 was subsequently used from January 1973 (ARH-2794 A, page 4) through June 1974 (ARH-CD-133 B, page 4) to receive evaporator bottoms from the in-tank solidification unit (heat exchanger used to evaporate waste) that was installed in tank 241-BY-112.

2.2.11 Comparison with Other Reports

Waste transfers into and waste removals from tanks 241-B-110 and 241-B-111 were summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132), *Supporting Document for the Historical Tank Content Estimate for B-Tank Farm* (WHC-SD-WM-ER-310), and *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311). In general, the information cited in Sections 2.2.1 through 2.2.10 is in agreement with these previous reports.

These previous reports accurately state the volume of waste transferred into and removed from tanks 241-B-110 and 241-B-111, as well as the volume of solids and total waste stored in each tank. However, there are two discrepancies between the information reported in these previous reports and this report.

These previous reports indicate that only 2C waste was transferred into the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 from February 1945 through June 1952. As discussed in Section 2.2.2, these tanks received low-activity cell drainage from tank 5-6 in B-Plant combined with 2C waste from June 1951 through July 1952 (see Section 2.2.2). Furthermore, WHC-MR-0132 erroneously reports that tanks 241-B-110, 241-B-111, and 241-B-112 received low-activity cell drainage waste (5-6 waste), 1C, and 2C waste from July 1952 through September 1954, which in reality these tanks received flush water and waste from equipment cleaning in B-Plant from July 1952 through September 1954 (see Section 2.2.3).

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997.*

It has been established in Section 2.0 that second decontamination cycle (2C) wastes and tank 5-6 cell drainage wastes from the 221-B Bismuth Phosphate plant were transferred into tanks 241-B-110, 241-B-111, and 241-B-112. Additionally, these tanks received evaporator bottoms from the evaporator in cell 23 of the 221-B Plant and waste from fission product processing conducted in the 221-B Plant. The following sections provide a discussion of the wastes originating from these operations.

3.1 B AND T BISMUTH PHOSPHATE PROCESS PLANTS

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from irradiated nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion.

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste, sometimes referred to as coating waste (CW), was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

The fuel element uranium cores (see item [2] in Figure 2) were then dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented its precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed with water to separate the acidic supernatant from the precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW).

Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). The laboratory tests indicate the percentage of cesium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively. Additionally, the laboratory tests indicate that approximately 99.7 percent of the uranium partitioned to the metal waste, 0.3 percent of the uranium partitioned to the 1C waste, and 0.008 percent of the uranium partitioned to the 2C waste.

The plutonium-bearing cake was then dissolved in nitric acid and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products ("by-product precipitation"), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C) were combined with the coating removal waste and transferred to single-shell tanks. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28). The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

Table 2 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the 221-B/T bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C, and 2C that was stored in single-shell tanks are provided in Tables 3 and 4. The CW was combined with the 1C waste in the same tanks in the Bismuth Phosphate process. Note that the coating waste (CW) batch size shown in Table 2 is based on 6,600-lbs uranium, but that the metal waste (MW) dissolution batch size is based on 2,200-lbs uranium.

Figure 2. Bismuth Phosphate Process Diagram

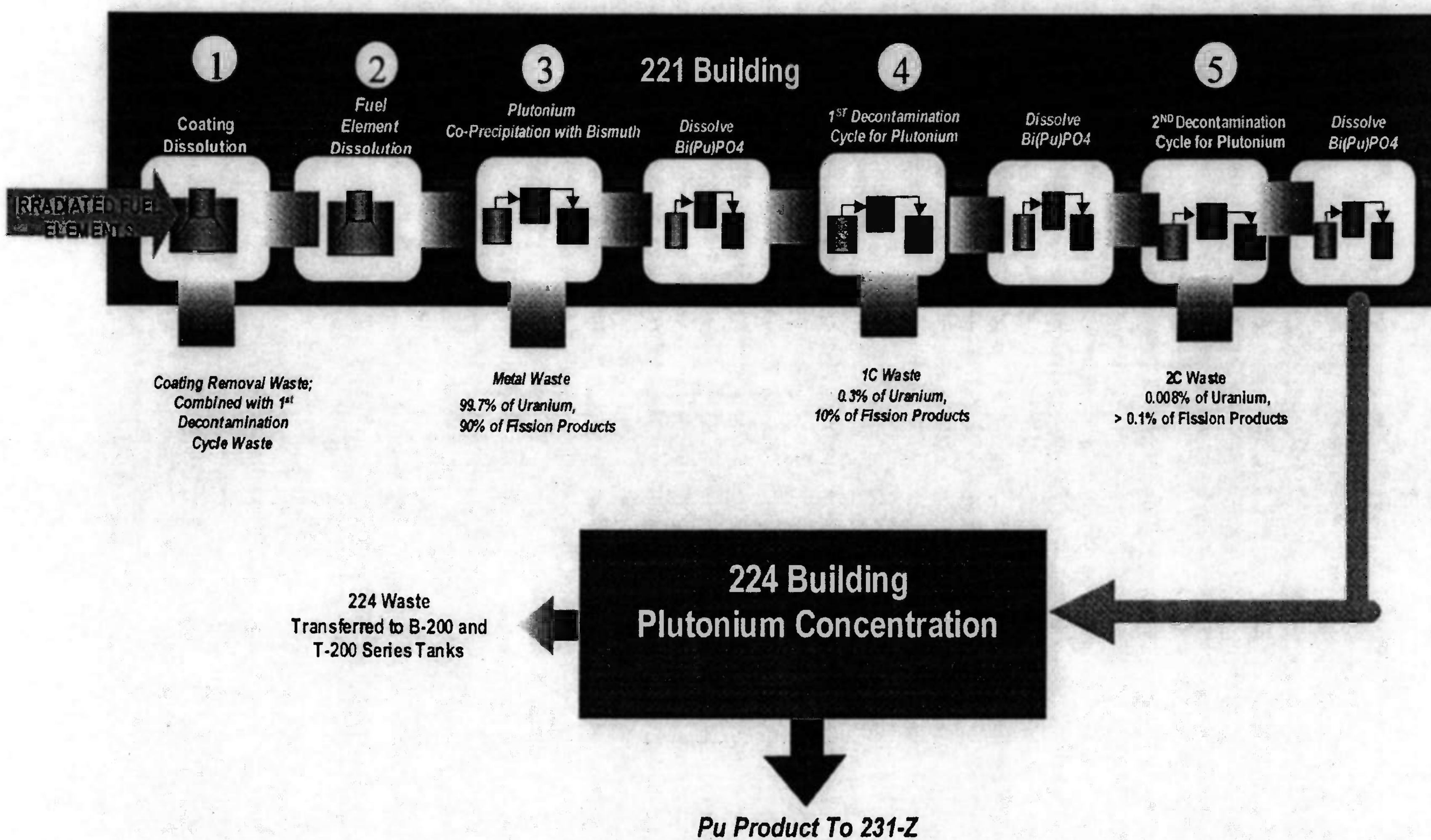


Table 2. Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet [1]

Analyte [2]	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04[6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02[6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

(1) See HW-23043

(2) Analyses are reported in grams per liter, except for gamma activity, which is counts per minute per mL.

(3) HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.

(4) Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).

(5) Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).

(6) Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Table 3. Analyses of Bismuth Phosphate Process Supernatants Stored [1,2]

Waste Type	Tank	pH	Pu µg/liter	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	10	35	110[5]	25[5]	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? [3]	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µg/liter**	**Gross Beta Counts / minute/ cc**	**Gross Gamma Counts / minute/ cc**	**Date Sampled**
2C	T-110	Not reported [4]	15	4.9E+04	30	7-13-1945
2C	T-110	9.8[4]	19	6.9E+04	55	7-25-1945
2C	B-110	9.6[4]	8.5	7.0E+04	55	7-25-1945

Notes:

(1) See HW-10728 and HW-3-3220.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 2C waste was neutralized to a pH of approximately 10. The wastes collected in tanks 241-B-110, 241-B-111, 241-B-112, 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Decrease in gross beta and gross gamma concentrations shown for the tank T-101 waste samples is due to decay of fission products with short half-lives.

Table 4. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant

Tank	Date Filled	Pu µg/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y - Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.12	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.12	Not reported	0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.005	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.02**	**0.15**						

Notes:

[1] HW-36717, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, May 16, 1955, W. W. Schulz, General Electric Company, Richland, Washington.

[2] HW-20195, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, February 5, 1951, General Electric Company, Richland, Washington.

[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

3.1.1 221-B Cell Drainage (5-6) Waste

During the operation of the 221-B Bismuth Phosphate plant, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B Plant contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High-activity waste collected in 221-B Plant tank 5-9 could be jetted to single-shell tank 241-B-107 (HW-10475-C, page 918). Alternatively, the waste could be transferred to process vessels with the 221-B Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-DEL, page 28).

From April 1945 through September 4, 1947 (HW-33591, page 3), low-activity cell drainage waste collected in tank 5-6 was transferred to tank 241-B-361, which gravity drained to reverse well number 241-B-361 (also referred to as 216-B-5). Tank 241-B-361 also received waste from the 224-B Concentration building from May 1945 to October 1946.

Crib number 5-6 was used to dispose of the cell drainage waste from August 12, 1948 through July 4, 1951 (HW-33591, page 3). Cell drainage waste was routed to cribs 241-B-1 and 241-B-2 from October 3, 1947 through August 12, 1948 (HW-44784, page 27). After July 4, 1951, cell drainage waste was transferred along with 2C waste to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (HW-21506-DEL, pages 56 and 57) and discharged to the 241-B-3 (also referred to as crib 216-B-8) until July 1953 and then the 241-B-1 and 241-B-2 cribs from December 1954 through October 1955 (HW-44784, page 27).

Table 5 provides analyses of cell drainage waste that was collected in tank 5-6 and transferred to either directly to a crib or to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112. As evident from the analyses provided in Table 5, the neutralized, low-activity cell drainage waste contained soluble beta emitting radionuclides and plutonium. The plutonium, along with other metals, precipitated in the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, while soluble compounds were discharged to the crib.

Table 5. Composition of Tank 5-6 Cell Drainage Waste from 221-B Plant. (2 Sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
Tank 5-6 Cell Drainage Transferred to Crib [1,2]					
1948	January	No records			Total beta activity does not include radioactive iodine. Samples were measured for total alpha activity. Calculated Pu mass assumes that all alpha activity measured in samples was Pu. Uranium activity in samples contributed less than 8% of the total alpha activity [1].
	February	No records			
	March	No records			
	April	No records			
	May	No records			
	June	No records			
	July	No records			
	August	807,344	4	110	Tank 5-6, cell drainage waste routed to 5-6 Crib and tile field from 8/12/1948 through 7/04/1951 (HW-33591, page 3).
	September	945,276	9	590	
	October	1,284,019	8	225	
	November	1,278,568	16	185	
No records could be located for December 1948 through August 1949.					
1949	September	1.1E+06	3.8	78	
	October	1.05E+06	6.1	157	
	November	8.6E+05	2.8	64	
	December	8.3E+05	2.6	83	
1950	January	8.7E+05	2.7	83	
	February	9.0E+05	1.9	64	
	March	1.05E+06	2.0	46	
	April	9.4E+05	2.0	61	
	May	1.02E+06	4.8	301	
	June	9.9E+05	5.2	394	
	July	1.3E+06	4.9	682	
	August	1.5E+06	6.7	1,807	
	September	1.2E+06	10.8	630	
	October	1.1E+06	7.4	226	
	November	9.5E+05	6.8	272	
	December	1.0E+06	6.4	358	
No records could be located for January 1951 through December 1951. Beginning in July 1951, Tank 5-6 cell drainage waste along with 2C waste was routed to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112.					
Tank 5-6 Cell Drainage Waste Discharged to the Cascade of Tanks 241-B-110, 241-B-111, and 241-B-112 [3,4]					
Year	**Month**	**Liters**	**Pu Grams**	**Total Beta Activity Curies**	**Comment**
1952	January	8.95E+05	7.1	1,150	
	February	8.20E+05	3.4	230	
	March	8.22E+05	4.8	335	
	April	3.08E+05	1.1	111	
	May	2.34E+05	1.1	30	
	June	3.17E+05	1.1	35	
	July	2.64E+05	1.1	55	
	August	3.28E+05	1.0	26	
	September	2.30E+05	1.1	13	
	October	2.12E+05	7.1	344	Cleanout of 221-B Plant process equipment and cells conducted from October 1952 through July 1953.

Table 5. Composition of Tank 5-6 Cell Drainage Waste from 221-B Plant. (2 Sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
1952	November	5.15E+05	38.4	1,295	
	December	4.21E+05	35.4	1,825	
1953	January	3.65E+05	9.1	880	
	February	2.82E+05	3.2	88	
	March	1.77E+05	5.0	76	
	April	1.64E+05	1.7	15	
	May	1.49E+05	6.4	39	
	June	1.90E+05	2.0	18	
	July	1.65E+05	5.5	5	
	August				No tank 5-6 cell drainage discharges reported for August 1953 through November 1954.
	September				
	October				
	November				
	December				
1954	January				
	February				
	March				
	April				
	May				
	June				
	July				
	August				
	September				
	October				
	November				
	December	0.57E+05	0.02	0.09	Tank 5-6, cell drainage waste routed to 241-B-1 and 241-B-2 cribs beginning in December 1954. December 1954 through June 1955 values reported in HW-38562, page 9.
1955	January	0	0	0	
	February	0.36E+05	0.16	4.75	
	March	1.52E+05	4.27	45.6	
	April	2.74E+05	0.486	8.2	
	May	1.26E+05	0.648	10.3	
	June	1.05E+05	0.28	9.46	
	July	2.51E+05	0.321	4.77	July 1955 through October 1955 values reported in HW-44784, page 27.
	August	2.27E+05	4.48	32.0	
	September	1.75E+05	1.46	12.8	
	October	1.26E+05	11.5	118	
No discharge of tank 5-6, cell drainage waste or any waste from tanks 241-B-110, 241-B-111, or 241-B-112 was made to a crib after October 1955.					

Notes:

(1) HW-11908, page 1
(2) HW-20583, page 7
(3) HW-25301, page 3
(4) HW-33591, page 8

3.2 221-B PLANT FISSION PRODUCTS PROCESSING

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

3.2.1 STRONTIUM AND RARE EARTHS PROCESSING

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, page B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144 and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.2.2 CESIUM AND STRONTIUM PROCESSING

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917).

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PRD-SEP-68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges that had been acidified (known as PAS) in 244-AR Vault and transferred to B-Plant for centrifugation to separate solids and strontium removal (PRD-SEP-68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until 1977.

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANKS 241-B-110 AND 241-B-111

The U.S. Department of Energy uses several factors to determine the disposition of radioactive wastes (DOE M 435.1). One of these factors is the concentration of alpha-emitting transuranic isotopes with half-life greater than 20 years present in the radioactive waste. Table 6 provides the concentrations of transuranic elements present in the wastes stored in tanks 241-B-110 and 241-B-111 as reported on March 31, 2003 from the Tank Waste Information Network (TWINS) database; http://twins.pnl.gov:8001/twins.htm. It is apparent from the information reported in Table 6 that the concentrations of transuranic elements in the wastes stored in tanks 241-B-110 and 241-B-111 both exceed 100 nanocuries per gram of waste. The concentration of transuranic elements present in the 241-B-110 and 241-B-111 wastes is consistent with these tanks having received 2C waste.

The concentrations of cesium-137 and strontium-90 present in the wastes stored in tanks 241-B-110 and 241-B-111 are also provided in Table 6. The concentrations of the fission products (Cs-137 and Sr-90) in these wastes is consistent with these tanks having received wastes from the strontium and rare earths and cesium ion exchange processes conducted at B-Plant.

Table 6. Concentrations of Radionuclides Present in Tank 241-B-110 and 241-B-111 Wastes

Tank	Np-237 ηCi/g	Pu-239 ηCi/g	Pu-240 ηCi/g	Am-241 ηCi/g	Sum of TRU ηCi/g	Cs-137 µCi/g	Sr-90 µCi/g
241-B-110	0.11	100	11	72.7	183.8	11.64	83.8
241-B-111	0.07	83	14.2	85.5	182.8	132.6	206.7

5.0 SUMMARY

The wastes transferred into tanks 241-B-110, 241-B-111, and 241-B-112 are summarized in Table 7. Tanks 241-B-110, 241-B-111, and 241-B-112 generally received waste from operations conducted in the 221-B Plant.

Tanks 241-B-110, 241-B-111, and 241-B-112 received second decontamination cycle (2C) waste from spent nuclear fuel reprocessing (Bismuth Phosphate process) conducted in the 221-B Plant from May 1945 through June 1952. Low-activity cell drainage (5-6) waste was also transferred from B-Plant into these three tanks from June 1951 through June 1952. After cessation of the Bismuth Phosphate process in June 1952, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from cleanout of B-Plant from July 1952 through September 1954. The 2C, 5-6, and equipment cleaning wastes were purposely precipitated in tanks 241-B-110 and 241-B-111 to separate transuranic elements (primarily plutonium and americium), with supernatant cascading into tank 241-B-112. The soluble fractions of these wastes were transferred from tank 241-B-112 to an underground crib.

Following the shutdown of B-Plant, tanks 241-B-110 and 241-B-111 received evaporator bottoms from the 242-B Evaporator in April 1954. The evaporator bottoms waste was subsequently transferred to other single-shell tanks as part of plans to reactivate B-Plant. Reactivation of B-Plant for spent nuclear fuel reprocessing was conducted from October 1955 through March 1957. Equipment and process cells were flushed as part of these reactivation activities. These flush solutions were routed to tanks 241-B-110, 241-B-111, and 241-B-112, with the supernatant discharged from tank 241-B-112 to an underground crib. No spent nuclear fuel was reprocessed in B-Plant during this period. Plans to reactivate B-Plant for spent fuel reprocessing were cancelled in March 1957, and the plant was idled.

B-Plant was then reactivated for separating fission products (e.g., strontium-90, rare earth elements, and cesium-137) from PUREX high-level waste and stored tank wastes. From September 1961 through June 1970, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from construction activities conducted at B-Plant, strontium and rare earth (Sr/RE) elements separations, cell 23 evaporator bottoms, and cesium ion exchange processing. Tank 241-B-112 also received from January 1973 through June 1974 evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

The Sr/RE waste, cell 23 evaporator bottoms, and cesium ion exchange process wastes were all transferred from tanks 241-B-110 and 241-B-111 to other single-shell tanks from 1965 through March 1972. Following these transfers, tanks 241-B-110 and 241-B-111 contained principally sludges formed from precipitation of the 2C waste and the Sr/RE waste, along with precipitated salts from the B-Plant cesium ion exchange waste. Tank 241-B-112 did not receive a measurable quantity of 2C sludge based on the cascade operating mode and sludge level measurements, but instead contains precipitated salts from B-Plant cesium ion exchange waste and evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

Table 7. Waste Types Added to Tanks 241-B-110, 241-B-111, and 241-B-112

Waste Type [1]	Tank 241-B-110	241-B-111	241-B-112
2C [2]	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951
2C + 5-6	6/1951 – 7/1952	6/1951 – 7/1952	6/1951 – 7/1952
B-Plant Equipment Cleaning Waste	7/1952 – 9/1954	7/1952 – 9/1954	7/1952 – 9/1954
EB from 242-B Evaporator	4/1954	4/1954	In advertent addition of some EB to this tank
B-Plant Reactivation for 4X Program (cancelled in 3/1957)	10/1955 – 4/1957	10/1955 – 4/1957	Not added to tank
B-Plant Construction for Sr/RE Process	9/1961 – 12/1962	9/1961 – 12/1962	9/1961 – 12/1962
B-Plant Sr/RE Processing	8/1963 – 6/1966	8/1963 – 6/1966	8/1963 – 6/1966
B-Plant equipment flushing	7/1966 – 1Q/1968	7/1966 – 10/1967	7/1966 – 10/1967
EB from B-Plant Cell 23 evaporator	1Q/1968	10/1967	Not added to tank
B-Plant IX	3Q/1969	3Q/1969 – 2Q/1970	3Q/1969 – 2Q/1970
EB from ITS	Not added to tank	Not added to tank	1/1973 – 6/1974

Notes:

[1] Waste Type Definitions:

2C: Second decontamination cycle waste from B-Plant Bismuth Phosphate process
5-6: B-Plant low-activity cell drainage
EB: Evaporator bottoms
ITS: In-Tank Solidification unit installed in tank 241-BY-112
IX: Waste from B-Plant cesium ion exchange process
Q: calendar year quarter
Sr/RE: Strontium / Rare Earths

[2] 2C waste routed to tanks 241-B-104, 241-B-105, and 241-B-106 during period when tanks 241-B-110, 241-B-111, and 241-B-112 were filled.

6.0 REFERENCES

60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey), Rockwell Hanford Operations, Richland, Washington.

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967*, January 15, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968*, April 16, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division-Waste Status Summary April 1, 1969 through June 30, 1969,* July 16, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969,* October 15, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969,* January 20, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970,* April 30, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970,* July 21, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970,* October 26, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970,* 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971,* 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971,* 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, 1970, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971,* 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971,* 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Chemical Processing Division Waste Status Summary April 1, 1974 through June 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-917, 1977, *Evaluation of Phosphotungstic Acid Process for Removal of Cesium-137 from PUREX Current Acid Waste,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-N-82, 1968, *Fission Process Product Summary,* Atlantic Richfield Hanford Company, Richland, Washington.

DDTS-Generated-491, 1957, "Lay-Away of the Bismuth Phosphate – TBP Plants and the Metal Waste Removal Facilities," (letter from A. T. Gifford, Director of Operations Division, to W. K. MacCready, General Manager Chemical Processing Department, General Electric

Company Hanford Atomic Products Operation, March 28), Atomic Energy Commission, Richland, Washington.

DOE M 435.1-1, 1999, *Radioactive Waste Management Manual*, July 9, 1999, U. S. Department of Energy, Washington, D.C.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doe/culres/mpd/toc.htm, U. S. Department of Energy, Richland Operations Office, Richland, Washington.

H-2-579, Rev. 12, 1975, *Waste Disposal System Plan & Details 241-B*, E. I. Du Pont De Nemours Company, Richland, Washington.

H-2-1984, Rev. 2, 1965, *Sect. 5 Waste Settling & Cribbing Tie-In Tank 241-112 To Tile Field*, General Electric Company, Richland, Washington.

H-2-1991, Rev.1, 1951, *Sect. 5 Waste Settling & Cribbing Schematic Layout*, General Electric Company, Richland, Washington.

HAN-45764, 1947, *200 Area Daily Log for July 1, 1947 through December 31, 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944 through December 1946*, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-45807-DEL, 1948, *200 Area Monthly Reports 1948*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-90907, 1965, *Monthly Status and Progress Report for February 1965*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95105-DEL, 1966, *Monthly Status and Progress Report for June 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95284-DEL, 1966, *Monthly Status and Progress Report for July 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96590-DEL, 1967, *Monthly Status and Progress Report for Januar1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96805-DEL, 1967, *Monthly Status and Progress Report for February 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97066-DEL, 1967, *Monthly Status and Progress Report for March 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-98918-DEL, 1967, *Monthly Status and Progress Report for October 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99196-DEL, 1967, *Monthly Status and Progress Report for November 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99396-DEL, 1967, *Monthly Status and Progress Report for December 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99604-DEL, 1968, *Monthly Status and Progress Report for January 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100127-DEL, 1968, *Monthly Status and Progress Report for March 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100357-DEL, 1968, *Monthly Status and Progress Report for April 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10321, 1948, *Cribbing – Second Cycle Waste*, General Electric Company, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10728, 1948, "Process Waste Data – 200 Areas," (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11908, 1948, *Audit of Radioactive Waste to Ground Through the 5-6 Crib Systems (January Through November 1948)*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-15550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17088, 1950, *The Underground Disposal of Liquid Wastes at the Hanford Works, Washington*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.

HW-25301, 1952, *Process Waste Disposal Summary – 200 Areas January through June 1952*, General Electric Company, Richland, Washington.

HW-25533-DEL, 1952, *Hanford Works Monthly Report for August 1952*, General Electric Company, Richland, Washington.

HW-25781-DEL, 1952, *Hanford Works Monthly Report for September 1952*, General Electric Company, Richland, Washington

HW-26047-DEL, 1952, *Hanford Works Monthly Report for October 1952*, General Electric Company, Richland, Washington

HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.

HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*,General Electric Company, Richland, Washington.

HW-27932-DEL, 1953, *Hanford Works Monthly Report for April 1953*, General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.

HW-28121, 1953, *Release of Radioactive Wastes to the Ground, May 20, 1953*, General Electric Company, Richland, Washington.

HW-28267-DEL, 1953, *Hanford Works Monthly Report for May 1953*, General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section, May 31, 1953*, Planning and Scheduling, Separations - Operations, General Electric Company, Richland, Washington.

HW-28576-DEL, 1953, *Hanford Works Monthly Report for June 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, June 30, 1953*, Planning and Scheduling, Separations – Operations, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section, December 31, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.

HW–31126, 1954, *Waste- Status Summary; Separations Section, February 1954*, Planning and Scheduling Separations – Operations, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, March 31, 1954*, Planning and Scheduling Separations – Operations, General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section, April 30, 1954,* Planning and Scheduling Separations – Operations, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section, September 31, 1954*, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-35825, 1955, *Project Proposal, Revision 1, Hanford 4X Program – Bismuth Phosphate Plants (Project CG-603)*, March 22, 1955, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, March 31, 1955*, Separations – Projects and Personnel Development Sub-Section, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

HW-36979B, 1954, *Summary of Tank Farm Operation from 0800 1-1-54 to 0800 12-31-54*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section, July 1955*, Separations – Projects and Personnel Development Sub-Section, General Electric Company, Richland, Washington.

HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1955*, General Electric Company, Richland, Washington.

HW-38955-REV, 1955, *In Farm Scavenging Operating Procedure and Control Data*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, October 1955*, Separations – Projects and Personnel Development Sub-Section, General Electric Company, Richland, Washington.

HW-44784, 1956, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1956*, General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, October 1956*, Planning and Scheduling – Production Operation, General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, January 31, 1957*, Planning and Scheduling – Production Operation, Hanford Atomic Products, Richland, Washington.

HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through December 1956*, General Electric Company, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, April 30, 1957*, Planning and Scheduling – Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department*, September 30, 1957, Planning and Scheduling – Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-55176, Pt. VI, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.

HW-63051, 1961, *The Recovery of Fission Product Rare Earth Sulfates from PUREX IWW*, General Electric Company, Richland, Washington.

HW-69011, 1961, *Project CGC-897 – Title I Design Fission Product Storage in B Plant*, General Electric Company, Richland, Washington.

HW-69534, 1961 *Laboratory Development of a Carrier Precipitation Process for the Recovery of Strontium from PUREX Wastes*, General Electric Company, Richland, Washington.

HW-71187-DEL, 1961, *Chemical Processing Department Monthly Report for September 1961*, General Electric Company, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, February 7, 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, July – December 1962*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-76848-DEL, 1963, *Chemical Processing Department Monthly Report for February 1963*, General Electric Company, Richland, Washington.

HW-77016, 1963, *B-Plant Phase I Information Manual*, General Electric Company, Richland, Washington.

HW-78817-DEL, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, January 9, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-81373, 1964, *Removal of Lead from B-Plant Cerium and Rare Earth Fractions*, General Electric Company, Richland, Washington.

HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.

ISO-651-RD, 1967, *Fission Product Process Engineering Monthly Report 01/1967 through 12/1967*, ISOCHEM INC., Richland, Washington

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

PRD-SEP-68-DEL, 1968, *Monthly Status and Progress Report September 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

RHO-RE-SA-169, 1986, *Sixteen Years of Cesium Recovery Processing at Hanford's B Plant*, Rockwell Hanford Operations, Richland, Washington.

RL-SEP-197, 1965, *Chemical Processing Department Monthly Report December 1964*, General Electric Company, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-ER-310, 1996, *Supporting Document for the Historical Tank Content Estimate for B-Tank Farm*, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

APPENDIX A

VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

January 1945 through September 1976

This page intentionally left blank.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 (1)

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1945	January	Not Reported	Not Reported	Not Reported			No waste transferred into these tanks.
	February	Not Reported	Not Reported	Not Reported	HW-7-1388-DEL	16 19	Operations assumed responsibility for B-Plant with construction completion on February 10, 1945. Dummy runs with water were underway at month-end for February 1945.
	March	Not Reported	Not Reported	Not Reported	HW-7-1544-DEL	22	Conducted chemical runs and testing of dissolvers using rejected aluminum cans.
	April	Not Reported	Not Reported	Not Reported	HW-7-1649-DEL	21	First irradiated fuel slugs were placed in process at B-Plant on April 13, 1945.
	May		6.5%		HW-7-1793-DEL	22	B-110, B-111, and B-112 operated as a cascade. Second decontamination cycle (2C) waste transferred from 221-B into B-110, which when filled overflows to B-111. B-111 overflows to B-112 when filled.
	June		8.1%		HW-7-1981-DEL	23	Receiving 2C waste from 221-B.
	July		11.1%		HW-7-2177-DEL	22	Receiving 2C waste from 221-B.
	August		16.1%		HW-7-2361-DEL	21	Receiving 2C waste from 221-B.
	September		22.1%		HW-7-2548-DEL	22	Receiving 2C waste from 221-B. 2C sludge being neutralized to pH 7 instead of pH 9-10 as previously conducted. More Pu carried into sludge at pH 7.
	October		29.6%		HW-7-2706-DEL	21	Receiving 2C waste from 221-B.
	November		35.8%		HW-7-2957-DEL	21	Receiving 2C waste from 221-B.
	December		44.7%		HW-7-3171-DEL	21	Receiving 2C waste from 221-B.
1946	January		52.03%		HW-7-3378-DEL	24	Receiving 2C waste from 221-B
	February		59.2%		HW-7-3566-DEL	21	Receiving 2C waste from 221-B
	March		63.6%		HW-7-3751 DEL	21	Receiving 2C waste from 221-B
	April		72.3%		HW-7-4004-DEL	21	Receiving 2C waste from 221-B
	May		80.5%		HW-7-4193-DEL	21	Receiving 2C waste from 221-B
	June		88.2%		HW-7-4343-DEL	23	Receiving 2C waste from 221-B
	July		93.3%		HW-7-4542-DEL	22	Receiving 2C waste from 221-B

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 [1]

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	August		100%		HW-7-4739-DEL	23	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	September		100%		HW-7-5194-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	October		100%		HW-7-5362-DEL	28	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	November		100%		HW-7-5505-DEL	28	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	December		100%		HW-7-5630-DEL	25	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
1947	January		100%		HW-7-5802-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	February		100%		HW-7-5944-DEL	25	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	March		100%		HW-7-6048-DEL	24	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	April		100%		HW-7-6184-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	May		100%		HW-7-6391-DEL	23 - 24	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Started excavation for crib and tile field for disposal of 2C supernatant.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 (1)

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	June		100%		HW-7-7454-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	July		100%		HW-7283-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	August		100%		HW-7504-DEL	26 - 27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Crib and tile field for disposal of 2C supernatant about 65% complete.
	September		100%		HW-7795-DEL	27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	October		100%		HW-7997-DEL	25 - 27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Continued work on crib and tile field for disposal of 2C supernatant.
	November		100%		HW-8267-DEL	28 – 29	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Completed crib and tile field for disposal of 2C supernatant.
	December		100%		HW-8438-DEL	27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
1948	January		100%		HW-8931-DEL	28	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	February		100%		HW-9191-DEL	28 - 30	Cribbed 39,000-gallons of 2C supernatant from B-112. Liquid inadvertently entered test shaft adjacent to crib and needs to be removed before cribbing can resume. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 (1)

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March		96%		HW-9595-DEL	30 - 32	Cribbed 28,350-gallons (total to date 67,350-gallons) of 2C supernatant from B-112. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	April		80.2%		HW-9922-DEL	31 - 32	Cribbed 246,650-gallons (total to date 314,000-gallons) of 2C supernatant from B-112. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	May		69.8%		HW-10166-DEL	31 - 32	Additional cribbing of 2C supernatant will be dependent on measurements of underground radionuclide movement. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Cascade at 100%.
	June		76%		HW-10378-DEL	30	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	July		81.2%		HW-10714-DEL	32	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Resumed cribbing of 2C supernatant. Started cribbing 2C supernatant in tank B-104.
	August		85.4%		HW-10993-DEL	35 - 36	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Completed cribbing 2C supernatant in tank B-104 on August 2, 1948. Flow from crib became restricted after receiving only 312,000-gallons from B-104; suspect that 2C solids plugged crib drain lines. Started cribbing 2C supernatant from B-105, but drainage from crib remains slow.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 [1]

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	September		88.9%		HW-11226-DEL	32 - 33	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Cribbed about 130,000-gallons of 2C supernatant from B-105, but drainage from crib remains slow. Attempted several 10wt% acid flushes of crib to remove restriction, but drain remains slow.
	October		92.2%		HW-11499-DEL	33 – 34	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Cribbed about 81,000-gallons of 2C supernatant from B-105, but drainage from crib remains slow, limiting jetting rate to about 6,000-gallons per day.
	November		96.3%		HW-11835-DEL	35 - 36	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Cribbed about 207,300-gallons (total to date 418,300) of 2C supernatant from B-105. Crib permitted to overflow into associated tile field on November 12, 1948.
	December		100%		HW-12086-DEL	37	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Completed crib disposal of 2C supernatant from B-105 on December 8, 1948. Disposed of a total of 522,800-gallons. Started crib disposal of 2C supernatant from B-106. Disposed of 235,100-gallons to date.
1949	January		100%		HW-12391-DEL	38 - 39	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Continued crib disposal of 2C supernatant from B-106. Disposed of 458,000-gallons to date.
	February		100%		HW-12666-DEL	34 - 35	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Completed crib disposal of 2C supernatant from B-106. Disposed of a total of 531,250-gallons.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 (1)

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March		100%		HW-12937-DEL	40	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	April		100%		HW-13190-DEL	40	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	May		100%		HW-13561-DEL	42	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	June		100%		HW-13793-DEL	41	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	July		100%		HW-14043-DEL	42	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	August		100%		HW-14338-DEL	43	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	September		100%		HW-14596-DEL	43	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	October		100%		HW-14916-DEL	43	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	November		100%		HW-15267-DEL	44	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	December		100%		HW-15550-DEL	42	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Started crib disposal of 2C supernatant from tank B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 (1)

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1950	January		77.3%		HW-15843-DEL	44 -	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Continued crib disposal of 2C supernatant from tank B-112. Disposed of 360,000-gallons to date.
	February		67.4%		HW-17056-DEL	44	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Completed crib disposal of 2C supernatant from tank B-112. Disposed of 497,000-gallons in total.
	March		67.4%		HW-17410-DEL	47 – 48	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Started crib disposal of 2C supernatant from tank B-106. Disposed of 165,000-gallons to date.
	April		40.3%		HW-17660-DEL	46 - 47	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Conducted crib disposal of 2C supernatant from tanks B-106 and B-110. Disposed of 489,500-gallons in total from both tanks.
	May		58%		HW-17971-DEL	44	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 2C supernatant from tanks B-106 and B-110. Disposed of 328,000-gallons in total from both tanks.
	June		31% Note: The value reported in HW-18221-DEL seems to be in error, since no 2C supernatant is reported as being discharged from B-112.		HW-18221-DEL	43 - 44	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 486,000-gallons of 2C supernatant from tank B-105. All 2C supernatant emptied from tanks B-104, B-105, and B-106.
	July		73.3%		HW-18473-DEL	46	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	August		83.3%		HW-18740-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	September		92.6%		HW-19021-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 [1]

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	October		1,127,000-gallons		HW-19325-DEL	49 - 50	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 507,700-gallons of 2C supernatant from tank B-112.
	November		1,275,000-gallons		HW-19622-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	December		1,200,000-gallons		HW-19842-DEL	50	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 249,000-gallons of 2C supernatant from tank B-112.
1951	January		1,294,000-gallons		HW-20161-DEL	49 - 50	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 119,000-gallons of 2C supernatant from tank B-112.
	February		1,431,000-gallons		HW-20438-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	March		1,195,000-gallons		HW-20671-DEL	53	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 377,072-gallons of 2C supernatant from tank B-112.
	April		1,250,000-gallons		HW-20991-DEL	51	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 123,052-gallons of 2C supernatant from tank B-112.
	May		1,428,000-gallons		HW-21260-DEL	55	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. No crib disposal conducted in May 1951.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 (1)

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	June		1,555,000-gallons		HW-21506-DEL	54 - 56	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. No crib disposal conducted in June 1951. Completed process pipe alterations, which allow overflow of 2C supernatant to the crib. Previously, waste was jetted to crib. Completed piping modifications that collect low-activity cell drainage with 2C waste in B-110, B-11, and B-112 cascade.
	July		1,621,000-gallons		HW-21802-DEL	41	Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	August		Not Reported		HW-22075-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	September		Not Reported		HW-22304-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib. "Slightly contaminated water" jetted from catch tank for diversion box 154-B to second cycle waste cascade (HAN-68671-DEL, page 84)
	October		Not Reported		HW-22610-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	November		Not Reported		HW-22875-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	December		Not Reported		HW-23140-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1952	January	Not Reported	Not Reported	Not Reported	HW-23437-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib.
	February	Not Reported	Not Reported	Not Reported	HW-23698-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib.
	March	Not Reported	Not Reported	Not Reported	HW-23982-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib.
	April	530,000-gallons	530,000-gallons	542,000-gallons	HW-27838	6 - 9	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks as of 5-1-1952 is 401,000-gallons
	May	530,000-gallons	530,000-gallons	542,000-gallons	HW-27838	17 - 20	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks as of 5-31-1952 is 403,000-gallons
	June	530,000-gallons	530,000-gallons	542,000-gallons	HW-27838	28 - 31	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 407,000-gallons
	July	530,000-gallons	530,000-gallons	542,000-gallons	HW-27839	6 - 9	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 409,000-gallons

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	August	530,000-gallons	530,000-gallons	542,000-gallons	HW-27839	17 - 20	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 411,000-gallons
	September	530,000-gallons	530,000-gallons	542,000-gallons	HW-27839	28 - 31	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	October	530,000-gallons	530,000-gallons	542,000-gallons	HW-27840	6 - 9	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	November	530,000-gallons	530,000-gallons	542,000-gallons	HW-27840	17 - 20	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	December	530,000-gallons	530,000-gallons	542,000-gallons	HW-27840	28 - 31	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
1953	January	530,000-gallons	530,000-gallons	542,000-gallons	HW-27841	6 - 9	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	February	530,000-gallons	530,000-gallons	542,000-gallons	HW-27842	6 - 9	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March	530,000-gallons	530,000-gallons	542,000-gallons	HW-27775	6 - 9	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	April	530,000-gallons	530,000-gallons	542,000-gallons	HW-28043	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	May	530,000-gallons	530,000-gallons	542,000-gallons	HW-28377	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	June	530,000-gallons	530,000-gallons	542,000-gallons	HW-28712	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	July	530,000-gallons	530,000-gallons	542,000-gallons	HW-29054	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	August	530,000-gallons	530,000-gallons	542,000-gallons	HW-29242	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	September	530,000-gallons	530,000-gallons	542,000-gallons	HW-29624	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 378,000-gallons in B-110, 237,000-gallons in B-111 and no sludge in B-112.
	October	530,000-gallons	530,000-gallons	542,000-gallons	HW-29905	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 378,000-gallons in B-110, 237,000-gallons in B-111 and no sludge in B-112.
	November	530,000-gallons	530,000-gallons	542,000-gallons	HW-30250	4	Receiving flushes from 221-B Plant cleanout of section 5, 1st and 2nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 378,000-gallons in B-110, 237,000-gallons in B-111 and no sludge in B-112.
	December	425,000-gallons	530,000-gallons	542,000-gallons	HW-30498	4	Pumped B-110 to C-111. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
1954	January	425,000-gallons	530,000-gallons	542,000-gallons	HW-30851	4	Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
	February	Not legible	530,000-gallons	542,000-gallons	HW-31126	4	B-110 supernatant pumped to B-112, which discharges to crib. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
	March	421,000-gallons	530,000-gallons	542,000-gallons	HW-31374	4	B-110 received 221-B Plant section 5 waste. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	April	530,000-gallons	530,000-gallons	542,000-gallons	HW-31811	4	Supernatant in B-110 and B-111 transferred to B-112 and then cribbed. B-110 and B-111 received evaporator bottoms (EB) from tank B-105. EB volume in B-110 and B-111 estimated at 155,000-gallons and 335,000-gallons, respectively. Tanks receive 221-B section 5 and 15 flushes. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
	May	530,000-gallons	530,000-gallons	542,000-gallons	HW-32110	4	Tanks receive 221-B section 5 and 15 flushes. B-112 cascades to crib.
	June	530,000-gallons	530,000-gallons	542,000-gallons	HW-32389	4	Same as above.
	July	530,000-gallons	530,000-gallons	542,000-gallons	HW-32697	4	Same as above.
	August	530,000-gallons	530,000-gallons	542,000-gallons	HW-33002	4	Same as above.
	September	530,000-gallons	530,000-gallons	542,000-gallons	HW-33396	4	Same as above.
	October	530,000-gallons	530,000-gallons	542,000-gallons	HW-33544	4	No comments in monthly report.
	November	530,000-gallons	530,000-gallons	542,000-gallons	HW-33904	4	No comments in monthly report. 375,000-gallons sludge in B-110 and 195,000-gallons sludge in B-111.
	December	530,000-gallons	530,000-gallons	542,000-gallons	HW-34412	4	Same as above.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1955	January	Not legible	Not legible	Not legible	HW-35022	4	
	February	530,000-gallons	530,000-gallons	542,000-gallons	HW-35628	4	No comments in monthly report. Estimated sludge volume in all three tanks is 375,000-gallons in B-110, 195,000-gallons in B-111 and no sludge in B-112.
	March	348,000-gallons	530,000-gallons	542,000-gallons	HW-36001	4	Transferred 182,000-gallons of Evaporator Bottoms waste from B-110 to B-107 and B-108. Estimated sludge volume in all three tanks is 348,000-gallons in B-110, 195,000-gallons in B-111 and no sludge in B-112.
	April	348,000-gallons	530,000-gallons	542,000-gallons	HW-36553	4	No comments in monthly report.
	May	348,000-gallons	530,000-gallons	542,000-gallons	HW-37143	4	No comments in monthly report.
	June	348,000-gallons	530,000-gallons	542,000-gallons	HW-38000	4	No comments in monthly report.
	July	348,000-gallons	249,000-gallons	542,000-gallons	HW-38401	4	Transferred 281,000-gallons of Evaporator Bottoms waste from B-111 to B-108. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 249,000-gallons in B-111 and no sludge in B-112.
	August	348,000-gallons	249,000-gallons	542,000-gallons	HW-38926	4	Same as above.
	September	348,000-gallons	249,000-gallons	542,000-gallons	HW-39216	4	Same as above.
	October	356,000-gallons	249,000-gallons	542,000-gallons	HW-39850	4	221-B Plant being readied for restart to process irradiated reactor fuel. However, restart was not conducted. 221-B Plant flushes routed to tank B-110. No change in sludge volumes.
	November	361,000-gallons	249,000-gallons	542,000-gallons	HW-40208	4	221-B Plant flushes routed to tank B-110. No change in sludge volumes.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	December	451,000-gallons	249,000-gallons	542,000-gallons	HW-40816	4	221-B Plant flushes routed to tank B-110.
1956	January	486,000-gallons	249,000-gallons	542,000-gallons	HW-41038	4	221-B Plant flushes routed to tank B-110.
	February	496,000-gallons	249,000-gallons	542,000-gallons	HW-41812	4	221-B Plant flushes routed to tank B-110.
	March	501,000-gallons	249,000-gallons	542,000-gallons	HW-42394	4	221-B Plant flushes routed to tank B-110.
	April	530,000-gallons	249,000-gallons	542,000-gallons	HW-42993	4	221-B Plant flushes routed to tank B-110.
	May	530,000-gallons	249,000-gallons	542,000-gallons	HW-43490	4	221-B Plant flushes routed to tank B-110.
	June	530,000-gallons	251,000-gallons	542,000-gallons	HW-43895	4	221-B Plant flushes routed to tank B-110.
	July	530,000-gallons	251,000-gallons	542,000-gallons	HW-44860	4	221-B Plant flushes routed to tank B-110.
	August	530,000-gallons	265,000-gallons	542,000-gallons	HW-45140	4	221-B Plant flushes routed to tank B-110.
	September	530,000-gallons	265,000-gallons	542,000-gallons	HW-45738	4	221-B Plant flushes routed to tank B-110.
	October	530,000-gallons	268,000-gallons	542,000-gallons	HW-46382	4	221-B Plant flushes routed to tank B-110. Tank B-112 noted as being contaminated with evaporator bottoms waste.
	November	530,000-gallons	268,000-gallons	542,000-gallons	HW-47052	4	221-B Plant flushes routed to tank B-110. Tank B-112 noted as being contaminated with evaporator bottoms waste.
	December	530,000-gallons	270,000-gallons	542,000-gallons	HW-47460	4	221-B Plant flushes routed to tank B-110. Tank B-112 noted as being contaminated with evaporator bottoms waste.
1957	January	533,000-gallons	270,000-gallons	540,000-gallons	HW-48144	4	Same as above. Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	February	532,000-gallons	270,000-gallons	540,000-gallons	HW-48846	4	Same as above.
	March	532,000-gallons	270,000-gallons	538,000-gallons	HW-49523	4	Same as above.
	April	532,000-gallons	268,000-gallons	538,000-gallons	HW-50127	4	Same as above.
	May	535,000-gallons	279,000-gallons	538,000-gallons	HW-50617	4	No comments. 241-B-110 no longer receiving 221-B Plant flush solutions. Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111, and 23,000-gallons in B-112.
	June	535,000-gallons	279,000-gallons	538,000-gallons	HW-51348	4	Same as above.
	July	535,000-gallons	279,000-gallons	538,000-gallons	HW-51858	4	Same as above.
	August	535,000-gallons	279,000-gallons	538,000-gallons	HW-52414	4	Same as above.
	September	535,000-gallons	279,000-gallons	538,000-gallons	HW-52932	4	Same as above.
	October	535,000-gallons	279,000-gallons	43,000-gallons	HW-53573 HW-83906-C-RD, page 88	4	495,000-gallons of supernatant transferred from B-112 to tank C-101 for scavenging (i.e., Sr-90 and Cs-137 precipitation in CR Vault). Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111, and 43,000-gallons in B-112.
	November	535,000-gallons	279,000-gallons	43,000-gallons	HW-54067	4	243,000-gallons in B-110, 161,000-gallons in B-111, and 43,000-gallons sludge in B-112.
	December	535,000-gallons	279,000-gallons	43,000-gallons	HW-54519	4	Same as above.
1958	January	535,000-gallons	279,000-gallons	43,000-gallons	HW-54916	4	No comments.
	February	535,000-gallons	279,000-gallons	43,000-gallons	HW-55264	4	No comments.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March	535,000-gallons	282,000-gallons	43,000-gallons	HW-55630	4	Latest electrode reading for B-111.
	April	535,000-gallons	282,000-gallons	43,000-gallons	HW-55997	4	No comments.
	May	535,000-gallons	282,000-gallons	46,000-gallons	HW-56357	4	Latest electrode reading for B-112. Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111, and 43,000-gallons in B-112.
	June	535,000-gallons	282,000-gallons	46,000-gallons	HW-56761	4	No comments.
	July	535,000-gallons	282,000-gallons	46,000-gallons	HW-57122	4	No comments.
	August	535,000-gallons	279,000-gallons	46,000-gallons	HW-57550	4	Latest electrode reading for B-111.
	September	535,000-gallons	279,000-gallons	46,000-gallons	HW-57711	4	No comments.
	October	535,000-gallons	279,000-gallons	46,000-gallons	HW-58201	4	No comments.
	November	535,000-gallons	279,000-gallons	46,000-gallons	HW-58579	4	No comments.
	December	535,000-gallons	279,000-gallons	46,000-gallons	HW-58831	4	No comments.
1959	January	535,000-gallons	334,000-gallons	48,000-gallons	HW-59204	4	New electrode reading in B-111.
	February	535,000-gallons	334,000-gallons	46,000-gallons	HW-59586	4	No comments.
	March	532,000-gallons	334,000-gallons	46,000-gallons	HW-60065	4	No comments.
	April	532,000-gallons	334,000-gallons	46,000-gallons	HW-60419	4	No comments.
	May	532,000-gallons	334,000-gallons	46,000-gallons	HW-60738	4	No comments.
	June	532,000-gallons	334,000-gallons	46,000-gallons	HW-61095	4	No comments.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	July	532,000-gallons	334,000-gallons	46,000-gallons	HW-61582	4	No comments.
	August	532,000-gallons	334,000-gallons	45,000-gallons	HW-61952	4	No comments.
	September	532,000-gallons	334,000-gallons	45,000-gallons	HW-62421	4	No comments.
	October	532,000-gallons	334,000-gallons	43,000-gallons	HW-62723	4	Latest electrode reading for B-112.
	November	532,000-gallons	334,000-gallons	43,000-gallons	HW-63083	4	No comments.
	December	532,000-gallons	334,000-gallons	43,000-gallons	HW-63559	4	No comments.
1960	January	532,000-gallons	334,000-gallons	43,000-gallons	HW-63896	4	No comments.
	February	532,000-gallons	334,000-gallons	43,000-gallons	HW-64373	4	No comments.
	March	532,000-gallons	334,000-gallons	43,000-gallons	HW-64810	4	No comments.
	April	532,000-gallons	334,000-gallons	43,000-gallons	HW-65272	4	No comments.
	May	532,000-gallons	334,000-gallons	43,000-gallons	HW-65643	4	No comments.
	June	532,000-gallons	334,000-gallons	43,000-gallons	HW-66187	4	No comments.
	July	532,000-gallons	334,000-gallons	43,000-gallons	HW-66557	4	No comments.
	August	532,000-gallons	334,000-gallons	43,000-gallons	HW-66827	4	No comments.
	September	532,000-gallons	334,000-gallons	43,000-gallons	HW-67696	4	No comments.
	October	532,000-gallons	334,000-gallons	43,000-gallons	HW-67705	4	No comments.
	November	532,000-gallons	334,000-gallons	32,000-gallons	HW-68291	4	Tank B-112 shows an unexplained decrease of 11,000-gallons.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	December	532,000-gallons	334,000-gallons	32,000-gallons	HW-68292	4	No comments.
1961	January thru June	530,000-gallons	332,000-gallons	29,000-gallons	HW-71610	4	No comments. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 29,000-gallons in B-112.
	July thru December	538,000-gallons	480,000-gallons	40,000-gallons	HW-72625	4	Received 8,000-gallons into B-110 and 148,000-gallons into B-111 from 221-B Plant. Latest electrode reading for B-112. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 29,000-gallons in B-112.
1962	January thru June	532,000-gallons	554,000-gallons	35,000-gallons	HW-74647	4	Received 68,000-gallons from 221-B Plant into B-111. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru December	532,000-gallons	554,000-gallons	40,000-gallons	HW-76223	4	Received 5,000-gallons into B-112 from 221-B Plant. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 40,000-gallons in B-112.
1963	January thru June	530,000-gallons	343,000-gallons	271,000-gallons	HW-78279	4	Pumping B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru December	365,000-gallons	337,000-gallons	524,000-gallons	HW-80379	4	Receiving waste from fission product processing at 221-B Plant into B-110 and pumping from B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1964	January thru June	528,000-gallons	338,000-gallons	536,000-gallons	HW-83308	4	Receiving waste from fission product processing at 221-B Plant into B-110 and pumping from B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru December	528,000-gallons	392,000-gallons	536,000-gallons	RL-SEP-260	4	Receiving waste from fission product processing at 221-B Plant into B-110 and pumping from B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.
1965	January thru June	543,000-gallons	381,000-gallons	450,000-gallons	RL-SEP-659	4	Received 166,000-galloons of waste from fission product processing at 221-B Plant into B-111. Transferred 177,000-gallons of waste from B-111 to B-112. Transferred 263,000-gallons of waste from B-112 to AX-101. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru September	543,000-gallons	442,000-gallons	313,000-gallons	RL-SEP-821	4	Received 61,000-galloons of waste from fission product processing at 221-B Plant into B-111. Transferred 137,000-gallons of waste from B-112 to AX-101. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	October thru December	543,000-gallons	477,000-gallons	106,000-gallons	RL-SEP-923	4	Received 35,000-galloons of waste from fission product processing at 221-B Plant into B-111. Transferred 207,000-gallons of waste from B-112 to AX-101. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1966	January thru March	541,000-gallons	469,000-gallons	211,000-gallons	ISO-226	4	Received 997,000-galloons of waste from fission product processing at 221-B Plant into B-111. [**Note**: Volume received into B-111 seems to be in error and is likely only 97,000-gallons based on previous monthly report and waste inventories reported for B-111 and B-112.] Transferred 105,000-gallons of waste from B-111 to B-112. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	April thru June				ISO-404		Report could not be located.
	July thru September	541,000-gallons	442,000-gallons	337,000-gallons	ISO-538	4	Received 39,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 33,000-gallons of waste from B-111 to B-112. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	October thru December	541,000-gallons	461,000-gallons	337,000-gallons	ISO-674	4	Received 19,000-gallons of waste from fission product processing at 221-B Plant into B-111.
1967	January thru March	541,000-gallons	497,000-gallons	337,000-gallons	ISO-806	4	Received 36,000-gallons of waste from fission product processing at 221-B Plant into B-111.
	April thru June	541,000-gallons	395,000-gallons	528,000-gallons	ISO-967	4	Received 89,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 191,000-gallons from B-111 to B-112.
	July thru September	536,000-gallons	426,000-gallons	528,000-gallons	ARH-95	5	Received 31,000-gallons of waste from fission product (FP) processing at 221-B Plant into B-111. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 40,000-gallons in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	October thru December	466,000-gallons	243,000-gallons (FP) 280,000-gallons (EB)	120,000-gallons (FP) 49,000-gallons (EB)	ARH-326	5	153,000-gallons from B-110 transferred to B-112. Received 115,000-gallons from tank 9-2 in 221-B Plant into B-111. 221-B Plant cell 23 evaporator received feed from B-112 and transferred evaporator bottoms (EB) to B-111.
1968	January thru March	390,000-gallons (FP) 156,000-gallons (EB)	241,000-gallons (FP) 280,000-gallons (EB)	331,000-gallons (FP) 204,000-gallons (EB)	ARH-534	5	Received 311,000-gallons from 221-B Plant cell 23 evaporator bottoms (EB) into B-110. Tank B-110 received 135,000-gallons from 221-B Plant tank 9-2. B-112 received 366,000-gallons of waste from tank B-110. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 40,000-gallons in B-112.
	April thru June	390,000-gallons (FP) 156,000-gallons (EB)	239,000-gallons (FP) 280,000-gallons (EB)	343,000-gallons (FP) 204,000-gallons (EB)	ARH-721	5 – 6	No waste received into B-110, B-111, or B-112. 221-B Plant waste routed to BX-101 and BX-104. Sludge volumes estimated as 297,000-gallons in B-110, 241,000-gallons in B-111, and 18,000-gallons in B-112.
	July thru September	390,000-gallons (FP) 156,000-gallons (EB)	239,000-gallons (FP) 280,000-gallons (EB)	343,000-gallons (FP) 204,000-gallons (EB)	ARH-871	5 – 6	Same as above.
	October thru December	93,000 (FP), 155,000 (EB), 297,000-gallons sludge	276,000 (EB), 241,000-gallons sludge	325,000 (FP), 204,000 (EB), 18,000-gallons sludge	ARH-1061	5	No waste received into B-110, B-111, or B-112. 221-B Plant waste routed to BX-101 and AX-101.
1969	January thru March	93,000 (FP), 152,000 (EB), 297,000-gallons sludge	272,000 (EB), 241,000-gallons sludge	325,000 (FP), 207,000 (EB), 18,000-gallons sludge	ARH-1200 A	5	No waste received into B-110, B-111, or B-112. 221-B Plant waste routed to BX-Farm, AX-101, AX-103, and AX-104. B-112 received 3,000-gallons of waste from pump testing caisson.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	April thru June	93,000 (FP), 151,000 (EB), 297,000-gallons sludge	147,000 (EB), 241,000-gallons sludge	83,000 (EB), 18,000-gallons sludge	ARH-1200 B	5	No waste received into B-110 or B-111. Transferred 127,000-gallons from B-111 to B-112. Received 21,000-gallons of waste from catch tank 241-B-301-B into B-112. Catch tank 241-B-301-B receives drainage from diversion boxes B-151, B-152, B-153, and B-252. Transferred 597,000-gallons from B-112 to B-103.
	July thru September	38,000 (EB), 199,000 (IX) 297,000-gallons sludge	24,000 (EB), 35,000 (IX) 241,000-gallons sludge	82,000 (EB), 179,000 (IX) 18,000-gallons sludge	ARH-1200 C	5	Transferred 206,000-gallons of waste from B-110 to B-112. Received 199,000-gallons of ion exchange (IX) column wash waste from 221-B Plant into B-110 and 214,000-gallons of IX waste into B-111. Transferred 312,000-gallons of waste from B-111 to BY-112. Transferred 339,000-gallons of waste from B-112 to B-103.
	October thru December	38,000 (EB), 199,000 (IX) 297,000-gallons sludge	349,000 (IX) 241,000-gallons sludge	106,000 (EB), 430,000 (IX) 18,000-gallons sludge	ARH-1200 D	5	Received 1,119,000-gallons of ion exchange (IX) column wash waste from 221-B Plant into B-111. Transferred 275,000-gallons of waste from B-111 to B-112, 428,000-gallons of waste to B-108, and 367,000-gallons of waste to B-109.
1970	January thru March	38,000 (EB), 196,000 (IX) 297,000-gallons sludge	199,000 (IX) 232,000-gallons sludge	106,000 (EB), 429,000 (IX) 18,000-gallons sludge	ARH-1666 A	5	Received 276,000-gallons of ion exchange (IX) column wash waste from 221-B Plant into B-111. Transferred 208,000-gallons of waste from B-111 to B-103.
	April thru June	38,000 (EB), 195,000 (IX) 297,000-gallons sludge	259,000 (IX) 244,000-gallons sludge	106,000 (EB), 434,000 (IX) 18,000-gallons sludge	ARH-1666 B	5	Received 265,000-gallons of ion exchange (IX) column waste from processing PUREX Supernatant Neutralized (PSN) waste at 221-B Plant into B-111. Transferred 279,000-gallons of waste from B-111 to B-103. B-111 received 11,000-gallons water flush and 7,000-gallons of waste from catch tank 301-B.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	July thru September	38,000 (EB), 195,000 (IX) 297,000-gallons sludge	259,000 (IX) 244,000-gallons sludge	106,000 (EB), 434,000 (IX) 18,000-gallons sludge	ARH-1666 C	5	No waste received into B-110, B-111, or B-112.
	October thru December	38,000 (EB), 195,000 (IX) 297,000-gallons sludge	258,000 (IX) 244,000-gallons sludge	106,000 (EB), 434,000 (IX) 18,000-gallons sludge	ARH-1666 D	5	No waste received into B-110, B-111, or B-112.
1971	January thru March	38,000 (EB), 192,000 (IX) 297,000-gallons sludge	258,000 (IX) 244,000-gallons sludge	106,000 (EB), 433,000 (IX) 18,000-gallons sludge	ARH-2074 A	5	No waste received into B-110, B-111, or B-112.
	April thru June	38,000 (EB), 190,000 (IX) 297,000-gallons sludge	258,000 (IX) 244,000-gallons sludge	106,000 (EB), 432,000 (IX) 18,000-gallons sludge	ARH-2074 B	5	No waste received into B-110, B-111, or B-112.
	July thru September	1,000 (EB), 3,000 (IX) 297,000-gallons sludge	258,000 (IX) 244,000-gallons sludge	106,000 (EB), 433,000 (IX) 18,000-gallons sludge	ARH-2074 C	5	No waste received into B-110, B-111, or B-112. Transferred 223,000-gallons of waste from B-110 to B-102.
	October thru December	1,000 (EB), 3,000 (IX) 297,000-gallons sludge	257,000 (IX) 244,000-gallons sludge	10,000 (EB), 40,000 (IX) 18,000-gallons sludge	ARH-2074 D	5	No waste received into B-110, B-111, or B-112. Transferred 490,000-gallons of waste from B-112 to B-103.
1972	January thru March	2,000 (IX) 297,000-gallons sludge	0-gallons supernatant, 241,000-gallons sludge	14,000 (EB), 55,000 (IX) 18,000-gallons sludge	ARH-2456 A	4	B-112 received 19,000-gallons of waste from catch tank 301-B. Transferred 239,000-gallons of waste from B-111 to B-103.
	April thru June	6,000 (IX) 282,000-gallons sludge	0-gallons supernatant, 246,000-gallons sludge	15,000 (EB), 57,000 (IX) 18,000-gallons sludge	ARH-2456 B	4	No waste received into B-110, B-111, or B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	July thru September	0-gallons supernatant, 282,000-gallons sludge	17,000 (IX), 246,000-gallons sludge	13,000 (EB), 50,000 (IX) 14,000-gallons sludge	ARH-2456 C	4	B-110 received 6,000-gallons of flush water and transferred 24,000-gallons of waste to B-102.
	October thru December	0-gallons supernatant, 282,000-gallons sludge	3,000 (IX), 246,000-gallons sludge	13,000 (EB), 50,000 (IX) 14,000-gallons sludge	ARH-2456 D	4	B-110 received 3,000-gallons of flush water and transferred 14,000-gallons of waste to B-102.
1973	January thru March	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	288,000 supernatant 14,000-gallons sludge	ARH-2794 A	4	B-110 received 1,000-gallons of flush water and transferred 3,000-gallons of waste to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
	April thru June	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	289,000 supernatant 14,000-gallons sludge	ARH-2974 B	4	No waste received into B-110 or B-111. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
	July thru September	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	291,000 supernatant 14,000-gallons sludge	ARH-2974 C	4	No waste received into B-110 or B-111. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
	October thru December	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	291,000 supernatant 14,000-gallons sludge	ARH-2974 D	4	No waste received into B-110 or B-111. **Suspect B-110 tank as leaking.** B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
1974	January thru March	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	291,000 supernatant 14,000-gallons sludge	ARH-CD-133 A	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	April thru June	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	314,000 supernatant 14,000-gallons sludge	ARH-CD-133 B	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Transferred 8,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit. B-112 received 23,000-gallons of waste from BY-107.
	July thru September	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	315,000 supernatant 14,000-gallons sludge	ARH-CD-133 C	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Transferred 15,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	October thru December	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-133 D	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Added 4,000-gallons of water to B-110, then transferred 7,000-gallons of waste to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
1975	January thru March	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 A	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Transferred 2,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	April thru June	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 B	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 3,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	July thru September	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 C	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 5,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	October thru December	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 D	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 5,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
1976	January thru March	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-702 A	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 2,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	April thru June	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-702 B	4	No waste received into B-110 or B-111. **B-110 and B-111 removed from service.** Transferred 1,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	September	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	297,000 supernatant 35,000-gallons sludge	ARH-CD-702 I	7	No waste received into B-110 or B-111. B-110 and B-111 removed from service. Saltwell pumping B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.

(1) Percentages refer to the volume of waste present in all three tanks.

Table A-2. Cesium Ion Exchange Batch Processing Information for B-Plant July 1969 Through June 1970 [1]

Batch Number	Start Date	Finish Date	Total Cs-137 In Curies	Cs-137 Recovered in TK-20-1 Curies	Percentage Recovered	Cs-137 Loss to Waste Curies	Percentage Loss	Waste Type [2]
112	1-Jul	3-Jul	319,800	355,175	111.06%	6,487	2.0%	PSN
113	3-Jul	5-Jul	344,520	382,745	111.10%	1,942	0.6%	PSN
114	5-Jul	7-Jul	340,600	378,280	111.06%	3,425	1.0%	PSN
115	7-Jul	9-Jul	335,916	324,645	96.64%	528	0.2%	PSN
116	9-Jul	17-Jul	340,600	329,156	96.64%	2,159	0.6%	PSN
117	17-Jul	20-Jul	338,000	326,704	96.66%	16,547	4.9%	PSN
118	20-Jul	24-Jul	451,500	544,336	120.56%	5,189	1.1%	PSN
119	24-Jul	27-Jul	392,600	473,304	120.56%	8,993	2.3%	PSN
120	27-Jul	28-Jul	522,126	515,000	98.64%	6,953	1.3%	CAW
121	·28-Jul	31-Jul	408,200	400,920	98.22%	6,128	1.5%	PSN
122	31-Jul	2-Aug	351,000	344,728	98.21%	5,536	1.6%	PSN
123	2-Aug	8-Aug	619,353	608,352	98.22%	10,055	1.6%	PSN
124	8-Aug	12-Aug	691,254	658,620	95.28%	1,752	0.3%	CAW
125	12-Aug	15-Aug	535,500	510,287	95.29%	4,625	0.9%	PSN
126	15-Aug	15-Aug	600,400	572,093	95.29%	5,810	1.0%	PSN
127	15-Aug	21-Aug	493,770	442,079	89.53%	2,310	0.5%	PSN
128	21-Aug	23-Aug	296,000	265,021	89.53%	11,381	3.8%	PSN
129	23-Aug	26-Aug	514,500	425,439	82.69%	4,811	0.9%	PSN
130	26-Aug	29-Aug	740,000	611,886	82.69%	19,663	2.7%	PSN
131	29-Aug	2-Sep	298,797	247,108	82.70%	1,280	0.4%	CAW
132	2-Sep	5-Sep	900,000	744,367	82.71%	1,476	0.2%	CAW
133	5-Sep	8-Sep	502,326	673,597	134.10%	15,006	3.0%	PSN
134	8-Sep	12-Sep	576,704	773,443	134.11%	4,733	0.8%	PSN
135	12-Sep	15-Sep	516,675	724,210	140.17%	17,227	3.3%	PSN
136	15-Sep	18-Sep	452,430	634,124	140.16%	9,332	2.1%	PSN
137	18-Sep	22-Sep	539,396	755,881	140.13%	15,451	2.9%	PSN
138	22-Sep	25-Sep	538,153	754,122	140.13%	36,025	6.7%	PSN
139	25-Sep	28-Sep	464,407	650,663	140.11%	15,928	3.4%	PSN
140	28-Sep	30-Sep	510,808	555,764	108.80%	21,758	4.3%	PSN
141	30-Sep	3-Oct	864,283	940,236	108.79%	173	0.0%	CAW
		Subtotal	**14,799,618**	**15,922,285**	**107.59%**	**262,683**	**1.8%**	
142	3-Oct	6-Oct	556,600	498,968	89.65%	16,701	3.0%	PSN
143	6-Oct	9-Oct	554,625	497,312	89.67%	10,459	1.9%	PSN
144	9-Oct	14-Oct	722,680	647,632	89.62%	72	0.0%	CAW
145	14-Oct	17-Oct	626,750	561,877	89.65%	6,153	1.0%	PSN
146	17-Oct	20-Oct	547,500	490,690	89.62%	17,017	3.1%	PSN
147	20-Oct	22-Oct	685,410	614,521	89.66%	15,094	2.2%	PSN
148	22-Oct	26-Oct	773,938	1,133,437	146.45%	1,088	0.1%	CAW
149	26-Oct	3-Nov	403,832	591,494	146.47%	1,544	0.4%	CAW
150	3-Nov	6-Nov	602,915	883,069	146.47%	3,913	0.6%	PSN
151	6-Nov	9-Nov	576,000	497,719	86.41%	5,755	1.0%	PSN
152	9-Nov	13-Nov	364,800	315,281	86.43%	12,200	3.3%	PSN

Table A-2. Cesium Ion Exchange Batch Processing Information for B-Plant July 1969 Through June 1970[1]

Batch Number	Start Date	Finish Date	Total Cs-137 In Curies	Cs-137 Recovered in TK-20-1 Curies	Percentage Recovered	Cs-137 Loss to Waste Curies	Percentage Loss	Waste Type[2]
153	13-Nov	17-Nov	663,348	721,056	108.70%	5,780	0.9%	PSN
154	17-Nov	21-Nov	457,080	496,944	108.72%	5,100	1.1%	PSN
155	21-Nov	28-Nov	674,584	589,706	87.42%	7,400	1.1%	PSN
156	28-Nov	29-Nov	503,130	439,826	87.42%	9,440	1.9%	PSN
157	29-Nov	2-Dec	1,023,000	894,468	87.44%	0	0.0%	CAW
158	2-Dec	6-Dec	629,428	445,787	70.82%	14,300	2.3%	PSS
159	6-Dec	11-Dec	934,144	661,211	70.78%	15,000	1.6%	PSS
160	11-Dec	16-Dec	365,796	527,110	144.10%	5,000	1.4%	PSN
161	16-Dec	20-Dec	597,520	861,084	144.11%	2,000	0.3%	CAW
162A	20-Dec	23-Jan	193,800	279,174	144.05%	0	0.0%	CAW
162B	20-Dec	23-Jan	81,342	117,632	144.61%	0	0.0%	PSN
163	23-Jan	13-Feb	563,115	589,683	104.72%	2,800	0.5%	CAW
164A	13-Feb	5-Mar	369,132	386,562	104.72%	544	0.1%	CAW
164B	13-Feb	5-Mar	129,383	135,525	104.75%	190	0.1%	CAW
165	5-Mar	15-Mar	492,800	701,000	142.25%	223	0.0%	PSN
166	15-Mar	18-Mar	315,448	251,100	79.60%	33,298	10.6%	PSN
167	18-Mar	21-Mar	659,848	525,312	79.61%	33,377	5.1%	PSN
168	21-Mar	15-Apr	381,334	303,588	79.61%	9,707	2.5%	PSN
169	15-Apr	19-Apr	620,200	424,908	68.51%	20,240	3.3%	PSN
170	19-Apr	22-Apr	689,079	472,161	68.52%	5,330	0.8%	PSN
171	22-Apr	25-Apr	472,878	323,931	68.50%	34,300	7.3%	PSN
172	25-Apr	28-Apr	458,000	169,644	37.04%	51,860	11.3%	PSN
173	28-Apr	1-May	476,110	176,356	37.04%	79,420	16.7%	PSN
174	8-May	10-May	218,191	320,790	147.02%	33,790	15.5%	PSN
175	13-May	17-May	340,974	501,299	147.02%	7,000	2.1%	PSN
176	19-May	21-May	620,368	911,911	147.00%	2,070	0.3%	CAW
177R	24-May	25-May				620	Rework of batches 173, 174, 175.	
178	25-May	29-May	499,366	583,778	116.90%	22,400	4.5%	PSN
179	29-May	2-Jun	396,864	463,922	116.90%	37,900	9.5%	PSN
180	2-Jun	4-Jun	526,176	456,515	86.76%	120	0.0%	CAW
181	4-Jun	7-Jun	462,000	400,970	86.79%	14,970	3.2%	PSN
182	7-Jun	12-Jun	455,532	395,289	86.78%	16,900	3.7%	PSN
183	12-Jun	14-Jun	374,847	325,226	86.76%	15,600	4.2%	PSN
184	14-Jun	17-Jun	378,600	806,551	213.04%	13,500	3.6%	PSN + CO
185	17-Jun	20-Jun	390,352	831,449	213.00%	14,000	3.6%	PSN + CO
		Subtotal	**22,828,819**	**23,223,468**	**101.73%**	**604,175**	**2.6%**	
		Total	**37,628,437**	**39,145,753**	**104.03%**	**866,858**	**2.3%**	

[1] ARH-N-82, pages 146 through 149.

Notes:

[2] Definitions of Waste Type

CAW: Current Acid Waste, HLW from PUREX

PSN: PUREX Supernatant Neutralized. Neutralized to pH 10 PUREX HLW from tank farms.

PSN + CO: Recovered Cs-137 inventory is from PSN and Cs-137 from cleanout of equipment.

REFERENCES

ARH-N-82, 1968, *Fission Process Product Summary*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-95, 1967, *Chemical Processing Division Waste Status Summary, July to September*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967,* January 15, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary April 1, 1968 through June 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary July 1, 1968 through September 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary October 1, 1968 through December 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200A, 1969, *Chemical Processing Division Waste Status Summary January 1, 1969 through March 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary April 1, 1969 through June 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary July 1, 1973 through September 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 A, 1976, *Production and Waste Management Division Waste Status Summary January 1, 1976 through March 31, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 B, 1976, *Production and Waste Management Division Waste Status Summary April 1, 1976 through June 30, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 I, 1976, *Production and Waste Management Division Waste Status Summary September 30, 1976,* Atlantic Richfield Hanford Company, Richland, Washington.

HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1946,*Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.

HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.

HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.

HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.

HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, November 18, 1949, General Electric Company, Richland, Washington.

HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.

HW-15550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.

HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.

HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-23437-DEL, 1952, *Hanford Works Monthly Report for January 1952*, General Electric Company, Richland, Washington.

HW-23698-DEL, 1952, *Hanford Works Monthly Report for February 1952*, General Electric Company, Richland, Washington.

HW-23982-DEL, 1952, *Hanford Works Monthly Report for March 1952*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953,*General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953,* General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section, May 31, 1953,* Planning and Scheduling, Separations - Operations, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, June 30, 1953*, Planning and Scheduling, Separations – Operations, General Electric Company, Richland, Washington.

HW-29054, 1953, *Waste-Status Summary, Separations Section*, July 31, 1953, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section, August 31, 1953,*Planning and Scheduling, Separations, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section, September 30, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section, October 31, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW–31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, February 1954*, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954,* General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, April 30, 1954*, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington

HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.

HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations – Engineering and Control, July 31, 1954*, General Electric Company, Richland, Washington

HW-33002, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Projects and Personnel Development Sub-section, August 31, 1954*, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, September 31, 1954*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, November 30, 1954,* General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, December 31, 1954*, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1955*, General Electric Company, Richland, Washington.

HW-35628, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section*, Separations – *Projects and Personnel Development Sub-Section, April 30, 1955*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 1955*, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste- Status Summary; Separations Section*, Separations – *Projects and Personnel Development Sub-Section, June 30, 1955*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1955*, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1955*, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, September 30, 1955*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, October 1955*, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, November 30, 1955*, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, December 31, 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1956*, General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1956*, General Electric Company, Richland, Washington.

HW-42394, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1956*, General Electric Company, Richland, Washington.

HW-42993, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1956*, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 31, 1956*, General Electric Company, Richland, Washington.

HW-43895, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1956*, General Electric Company, Richland, Washington.

HW-44860, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1956*,General Electric Company, Richland, Washington.

HW-45140, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1956*, General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department, Production Operation – Chemical Processing Department, September 30, 1956*, General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste- Status Summary;* Chemical Processing Department, Planning and Scheduling – Production Operation, October 1956, General Electric Company, Richland, Washington.

HW-47052, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling Production Operation, November 30, 1956*, General Electric Company, Richland, Washington.

HW-47640, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, December 31, 1956*, General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, January 31, 1957*, Hanford Atomic Products, Richland, Washington.

HW-48846, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, February 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-49523, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, March 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, April 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50617, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, May 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51348, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, June 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54067, 1957, *Waste- Status Summary; Chemical Processing Department, November 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54519, 1957, *Waste- Status Summary; Chemical Processing Department, December 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54916, 1958, *Waste- Status Summary; Chemical Processing Department, January 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55264, 1958, *Waste- Status Summary; Chemical Processing Department, February 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55630, 1958, *Waste- Status Summary; Chemical Processing Department, March 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55997, 1958, *Waste- Status Summary; Chemical Processing Department, April 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56357, 1958, *Waste- Status Summary; Chemical Processing Department, May 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56761, 1958, *Waste- Status Summary; Chemical Processing Department, June 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57122, 1958, *Waste- Status Summary; Chemical Processing Department, July 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57550, 1958, *Waste- Status Summary; Chemical Processing Department, August 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57711, 1958, *Waste- Status Summary; Chemical Processing Department, September 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58201, 1958, *Waste- Status Summary; Chemical Processing Department, October 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58579, 1958, *Waste- Status Summary; Chemical Processing Department, December 16, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58831, 1959, *Waste- Status Summary; Chemical Processing Department, January 12, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-59204, 1959, *Waste- Status Summary; Chemical Processing Department, February 10, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-59586, 1959, *Waste- Status Summary; Chemical Processing Department, March 10, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60065, 1959, *Waste- Status Summary; Chemical Processing Department, April 16, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60419, 1959, *Waste- Status Summary; Chemical Processing Department, May 18, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60738, 1959, *Waste- Status Summary; Chemical Processing Department, June 15, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61095, 1959, *Waste- Status Summary; Chemical Processing Department, July 14, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61582, 1959, *Waste- Status Summary; Chemical Processing Department, August 18, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department, September 17, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department, October 19, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department, November 12, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department, December 15, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department, January 19, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-63896, 1960, *Chemical Processing Department – Waste Status Summary, February 12, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64373, 1960, *Chemical Processing Department – Waste Status Summary, March 17, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65272, 1960, *Chemical Processing Department – Waste Status Summary, May 18, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-66187, 1960*Chemical Processing Department – Waste Status Summary, July 25, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66557, 1960, *Chemical Processing Department – Waste Status Summary, August 22, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66827, 1960, *Chemical Processing Department – Waste Status Summary, September 20, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67696, 1960, *Chemical Processing Department – Waste Status Summary, November 29, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67705, 1960, *Chemical Processing Department – Waste Status Summary, November 30, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68291, 1961, *Chemical Processing Department – Waste Status Summary, January 25, 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-68292, 1961, *Chemical Processing Department – Waste Status Summary, January 30, 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-71610, 1961, *Chemical Processing Department – Waste Status Summary, November 6, 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, February 7, 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, August 8, 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-78279, 1963, *Chemical Processing Department – Waste Status Summary, June 1963*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, January 9, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-83308, 1964, *Chemical Processing Department – Waste Status Summary, July 15, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.

ISO-226, 1966, *Chemical Processing Division – Waste Status Summary January 1, 1966 through March 31, 1966*, ISOCHEM INC., Richland, Washington.

ISO-404, 1966, *Chemical Processing Division – Waste Status Summary April 1, 1966 through June 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 through September 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary,* Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary, April 5, 1967,* ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary, July 12, 1967,* ISOCHEM INC., Richland, Washington.

RL-SEP-260, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1964 Through December 31, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

CH2M HILL DOCUMENT RELEASE FORM

(1) Document Number:	RPP-16129	(2) New Revision Number: 1	☐ New ☐ Page Change ☑ Full Revision ☐ Cancel
(3) Impacted Documents:	none	(4) File Index Number:	
		(5) Effective Date:	December 16, 2004
(6) Document Title:	Origin of Waste in Single-Shell Tank 241-T-104		
(7) Change/Release Description:	see Record of Revision form		
(8) Change Justification:	General revision of document to discuss history of waste types transferred into this tank. Revised tank waste characterization discussion to reflect tank waste information network system information as of October 2004.		

(9) Approvals:

(a) Author (Print/Sign): Michael E. Johnson *Michael E. Johnson*	Date: 12/15/2004
(b) Responsible Manager (Print/Sign): Stewart M. Mackay *SMackay*	Date: 12/15/2004
(c) Reviewer (Optional, Print/Sign):	Date:
(d) Reviewer (Optional, Print/Sign):	Date:

(10) Distribution:

(a) Name	(b) MSIN	(a) Name	(b) MSIN
K. D. Boomer	H6-19	B. A. Higley	R2-12
M. J. Jennings	H6-03	J. G. Kristofzski	H6-03
S. M. Mackay	R2-58	D. E. Place	R2-12
A. Tedeschi	H6-19	W. Bryan	H6-19

(11) No. of Pages: ~~70~~ 68 N.F. 12-16-04

Release Stamp

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

(12) HDCS? ☑ Yes ☐ No

(13) Release Type: ☑ Public Release ☐ Internal Release

(14) Release Approval (Print/Sign): J. D. Aardal / *Janis Aardal* Date: 12-16-2004

A-6003-881 (08/04)

RPP-16129, Rev. 1

ORIGIN OF WASTE IN SINGLE-SHELL TANK 241-T-104

M. E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 821309 UC:
Cost Center: 501546 Charge Code:
B&R Code: Total Pages: ~~70~~ 68 N.F. 12-16-04

Key Words: Hanford, single-shell tank, 241-T-104, Bismuth phosphate process, first plutonium decontamination cycle, coating removal waste

Abstract: A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tank 241-T-104. This review was conducted to support decisions concerning disposition of the waste present in this tank.

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

J. Aardal 12-16-04
Release Approval Date

Release Stamp

Approved For Public Release

Tank Farm Contractor (TFC) RECORD OF REVISION	(1) Document Number RPP-16129	Page 1

(2) Title

Origin of Waste in Single-Shell Tank 241-T-104

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Resp. Engr. (print/sign/date)	Authorized for Release (6) Resp. Mrg. (print/sign/date)
RS1	Add - Executive Summary and Section 4: Discussion that the radionuclide inventory is based on analyses of two core samples and used 10-11-2004 best basis inventory. Add - Section 2: Expanded discussion on types of records reviewed and information available in each of these records. Add - Sections 2.2 & 3.1: Added discussion that plutonium precipitate separated from uranium and fission products was washed three times and the wash water combined with the uranium and fission product solution. Add - Section 2.2.5: Discussed that 1C/CW waste was transferred to tank 241-T-104 from February through September 1954. Change - Section 2.2.5: Date that 1C/CW waste was transferred to tanks 241-TY-101 and 241-TY-103 from November 1954 to October 20, 1954. Add - Section 3.1: Spent nuclear fuel reprocessing completed in the 221 BiPO4 process when plutonium was separated from the metal waste. Change - Table 3: Sr concentrations reported for samples from tanks T-108 (top), T-108 (bottom), C-112 and average for 1C/CW were incorrectly transcribed from the reference document. Error was corrected. Add - Section 3.1.1: Included discussion on off-gas scrubbers and silver chemical reactors that were installed in the 221 BiPO4 Plants.	M E Johnson 10/11/04 Michael E. Johnson	S Mackay 12/15/04 STEWART MACKAY

RPP-16129
Revision 1

ORIGIN OF WASTE IN SINGLE-SHELL TANK 241-T-104

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
October 2004

CH2MHILL
Hanford Group, Inc.
Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tank 241-T-104. This review was conducted to support decisions concerning disposition of the waste present in this tank.

Tank 241-T-104 was used to periodically receive first decontamination cycle (1C) waste and coating removal waste (CW) from the 221-T Bismuth Phosphate Plant from March 11, 1946, through October 19, 1954. No other waste types were received and stored in tank 241-T-104.

In the bismuth phosphate process, irradiated nuclear fuel elements were processed to recover plutonium. The aluminum coating on the fuel elements was first dissolved and separated from the uranium fuel elements. Then, the uranium fuel elements were dissolved. The plutonium was separated from the uranium and the majority of the fission products by carrier precipitation using bismuth phosphate. The uranium and fission product waste (so-called metal waste) was neutralized and transferred to various single-shell tanks. The plutonium and bismuth precipitate were processed through two additional precipitation steps to separate phosphate insoluble fission products (e.g., cerium, niobium, ruthenium, and zirconium) from the plutonium. These two precipitation steps were known as the first decontamination cycle (1C) and second decontamination cycle (2C). The coating removal waste (CW) was transferred with the 1C waste to various single-shell tanks. Similarly, the 2C waste was also transferred to various single-shell tanks.

During storage in the single-shell tanks, the 1C/CW waste precipitated solids which contained primarily bismuth, plutonium, americium, uranium, sodium, phosphate, sulfate, and metals. The 1C/CW supernatant contained primarily aluminum, sodium, nitrate, and cesium-137. As a result, tank 241-T-104 contained settled 1C/CW solids (i.e., bismuth and plutonium precipitate) and 1C/CW supernatant. The 1C/CW supernatant was removed from tank 241-T-104 and processed in the 242-T Evaporator (April through July 1951) or disposed in the east section of trench 216-T-14 (January 14, 1954). The interstitial liquid was removed from the 1C/CW sludge present in tank 241-T-104 and transferred to other underground storage tanks in two campaigns conducted February 1976 to August 1977 and March 24, 1996 to May 30, 1999.

Core samples of the sludge stored in tank 241-T-104 were obtained in 1992 and analyzed to determine chemical and radiochemical constituent concentrations. The concentration of transuranic elements present in the 1C/CW sludge contained in tank 241-T-104 is approximately 159.8 ηCi/g, based on the analytical results of the core samples for Pu-238, Pu-239, Pu-240 and Am-241. The average concentrations of cesium-137 and strontium-90 in the 1C/CW sludge as analyzed in the tank 241-T-104 core samples are approximately 0.155 μCi/g and 2.03 μCi/g, decay corrected to January 1, 2004.

CONTENTS

1.0 INTRODUCTION 5

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-T-104 5
- 2.1 DESCRIPTION OF TANK 241-T-104 5
- 2.2 WASTE TRANSFERS FOR TANK 241-T-104 8
  - 2.2.1 1C/CW Waste Storage (March 1946 – July 1946) 8
  - 2.2.2 1C/CW Supernatant Evaporation (March 1951 – July 1951) 9
  - 2.2.3 1C/CW Waste Cascade Filling (August 1951 – December 1951) 10
  - 2.2.4 Trench Disposal of 1C/CW Supernatant (January 1954) 10
  - 2.2.5 1C/CW Waste Cascade Filling (February 1954 – October 1954) 10
  - 2.2.6 Saltwell Pumping / Interim Stabilization 11
  - 2.2.7 Comparison with Other Reports 12

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 13
- 3.1 B AND T BISMUTH PHOSPHATE PROCESS PLANTS 13
  - 3.1.1 221-T and 221-B Plant Cell Drainage Waste 20
  - 3.1.2 221-T Equipment Decontamination Facility 21

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-T-104 24

5.0 SUMMARY 27

6.0 REFERENCES 28

APPENDIX

A. Volume of Wastes in Tanks 241-B-110, 241-B-111, and 241-B-112 ..... A-1

FIGURES

Figure 1. Tank 241-T-104 Plan View 7
Figure 2. Bismuth Phosphate Process Diagram 16

TABLES

Table 1. Estimated Composition of Bismuth Phosphate Plant Wastes 17
Table 2. Analyses of Bismuth Phosphate Process Supernatants Stored [1,2] 18
Table 3. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant. 19
Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant. (3 sheets) 21
Table 5. Best-Basis Inventory for Tank 241-T-104 Sludge. (3 sheets) 24
Table 6. Transuranic Elements and Fission Products in Tank 241-T-104 26

LIST OF TERMS

1C	first cycle of the bismuth phosphate plutonium decontamination process
2C	second cycle of the bismuth phosphate plutonium decontamination process
5-6	low activity cell drainage waste
cc	cubic centimeters
Ci	Curies
CW	Coating waste
DOE	U.S. Department of Energy
HLW	high-level waste
kg	kilograms
kL	kiloliters
LLW	low-level waste
MW	Metal waste
TRU	transuranic
ηCi/g	nanocuries per gram
μCi/cc	microcuries per cubic centimeters
μCi/g	microcuries per gram
μg/cc	micrograms per cubic centimeters
μg/g	micrograms per gram

1.0 INTRODUCTION

The origin of the waste in tank 241-T-104 has been reviewed to provide information for determining the disposition of this waste. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tank 241-T-104. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to single-shell tank 241-T-104. Section 4.0 provides a discussion on the radionuclide analyses of the waste in single-shell tank 241-T-104. Section 5 summarizes the waste types that were transferred into single-shell tank 241-T-104.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANK 241-T-104

This section provides a brief description of single-shell tank 241-T-104 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the waste presently stored in single-shell tank 241-T-104, publicly available reports for the Hanford Site were reviewed. Documents reviewed included the Hanford site contractors' monthly reports (1945 through 1975), Army Corp of Engineers monthly reports (December 1944 through December 1946), U. S. Atomic Energy Commission monthly reports (1947 through 1954), waste disposal reports (1948 through 1975), tank farm waste status summary reports, and miscellaneous letters and technical reports.

The Hanford site contractors' monthly reports for January 1945 through July 1951 list the volume of waste stored in the single-shell tanks, with the exception of the B-200 and T-200 series single-shell tanks. No records were located that provided the volume of wastes stored in the single-shell tanks from August 1951 through February 1952. Beginning in March 1952, waste transfers and the volume of waste stored in each single-shell tank were reported for each tank in a waste status summary report.

With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/ or the U.S. Department of Energy (DOE) Information Bridge at http://www.osti.gov/bridge/. The waste status summary reports are available only as photocopies from Hanford Site Records Information Management Services organization.

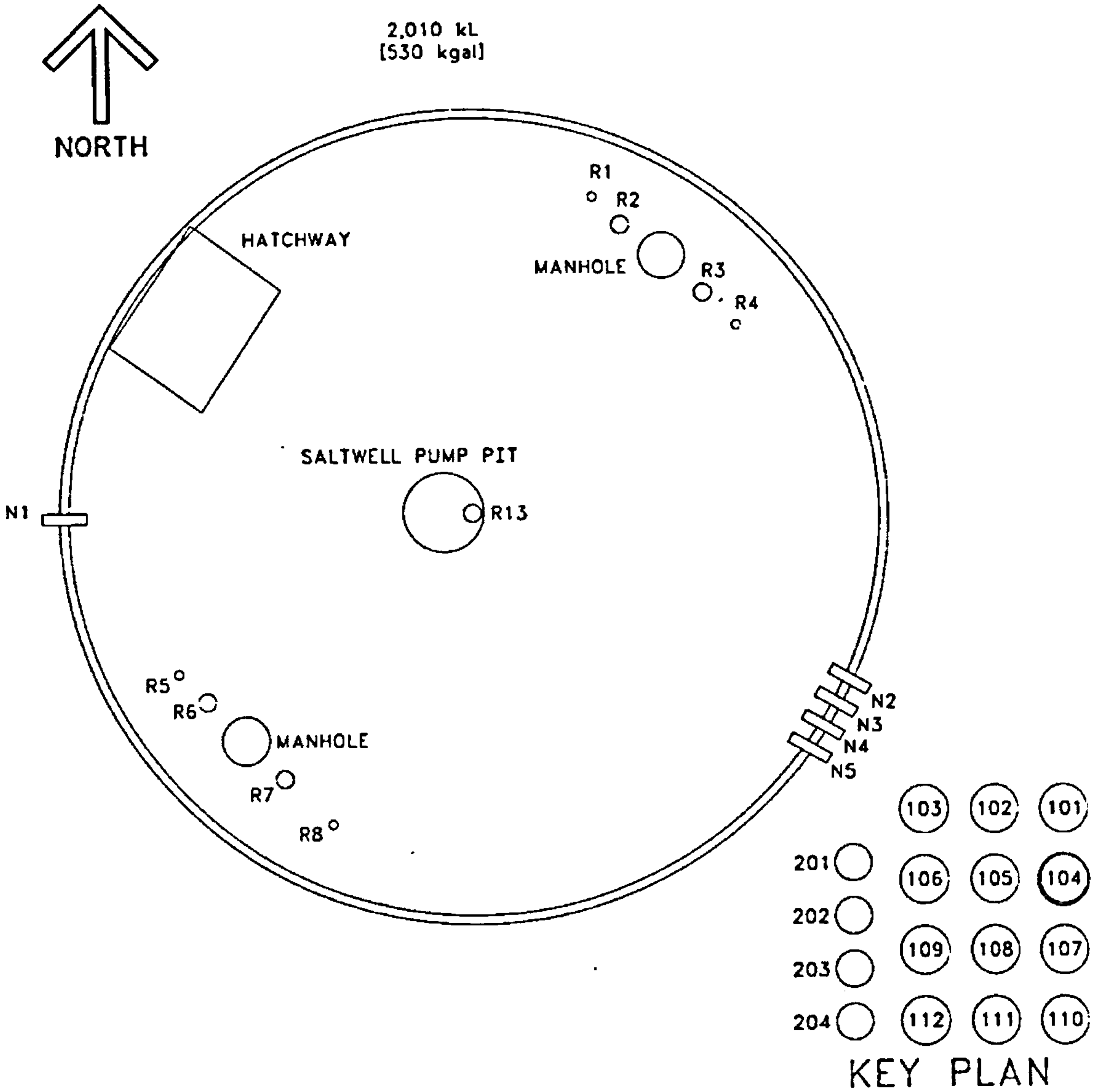
2.1 DESCRIPTION OF TANK 241-T-104

Single-shell tank 241-T-104 was originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX) and is one of the twelve, 100-series tanks in 241-T Tank Farm. Figure 1 provides a plan view of tank 241-T-104. The 100-series tanks are seventy-five-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. The steel liner extends to a height of nineteen-foot. Each 100-series tank has a design capacity of 530,000 gallons at a liquid depth of sixteen-feet, eight-inches. The 241-T Tank Farm also includes four 200-series tanks that are of similar construction as the 100-series tanks, but are only twenty-foot diameter, and each has a capacity of 55,000-gallons.

Single-shell tank 241-T-104 has five nozzles identified as N1 through N5. Tank 241-T-105 was connected via an underground overflow pipeline (nozzle N1 in Figure 1) to allow waste to cascade to tank 241-T-105. Tank 241-T-105 was also connected via a separate underground overflow pipeline to tank 241-T-106, which allowed waste to cascade from tank 241-T-104 into tank 241-T-105 and then into tank 241-T-106. In addition to the overflow piping, each tank is equipped with four, 3-inch diameter stainless steel inlet pipes.

Originally, three of the four inlet pipes (nozzles N2 through N4 in Figure 1) on tank 241-T-104 were connected to diversion box 241-T-153. The four inlet pipes for tanks 241-T-105 and 241-T-106 were blanked off close to each tank (HW-10475-C, page 907 and 908). However, on July 23, 1946, piping modifications were conducted to allow the direct transfer of waste from 221-T Plant through diversion box 241-T-153 to tank 241-T-105 (H-2-578, H-2-755, and HAN-45762, pages 26 and 32). This allowed tank 241-T-105 to be independently filled with waste that could then cascade through the overflow pipeline to tank 241-T-106. Waste transfers into tank 241-T-104 and the operation of the tanks 241-T-104, 241-T-105 and 241-T-106 as a cascade are discussed in more detail in Section 2.2.

Figure 1. Tank 241-T-104 Plan View



2.2 WASTE TRANSFERS FOR TANK 241-T-104

The following sections describe in chronological order the waste transferred into tank 241-T-104 and the waste disposition. Appendix A provides a listing of the waste volume present in tank 241-T-104 from 1945 through 1977. The only types of waste transferred into tank 241-T-104 were coating removal waste and first decontamination cycle waste from the bismuth phosphate process conducted in the 221-T Plant.

In the bismuth phosphate process, irradiated nuclear fuel was processed to separate plutonium using the bismuth phosphate process. The coating on the irradiated nuclear fuel was initially dissolved and separated from the uranium fuel elements. The dissolved fuel coating was referred to as coating removal waste. The uranium fuel elements were then dissolved. Plutonium was separated from the dissolved uranium by precipitation and centrifugation of the plutonium precipitate. The plutonium precipitate was washed three times and the wash solution combined with the uranium and fission products that remained in solution. The uranium and fission products that remained in solution were discarded as waste to the single-shell tanks. The plutonium precipitate was dissolved and processed through two successive precipitation steps to separate fission products from the plutonium. These precipitation steps were referred to as the first and second decontamination cycles. The waste from each decontamination cycle was referred to as 1C and 2C waste. The plutonium was further processed in the 224-T Concentration Building and the 231-Z Isolation Plant before shipment from the Hanford Site. Section 3.0 discusses the bismuth phosphate process in greater detail.

2.2.1 1C/CW Waste Storage (March 1946 – July 1946)

Irradiated nuclear fuel was first processed in 221-T Plant beginning on December 26, 1944 (HW-7-1293-DEL, page 19). The first decontamination cycle (1C) waste was combined with the coating removal waste (CW) and transferred to the cascade of tanks 241-T-107, 241-T-108, and 241-T-109. The combined 1C/CW waste was reported as being collected in tank 241-T-107 in February 1945 (HW-7-1338-DEL, page 22). Tanks 241-T-107, 241-T-108, and 241-T-109 continued to receive the combined 1C/CW waste until March 10, 1946, when these tanks were reported as being filled (HW-7-3751-DEL, pages 20 and 21).

On March 11, 1946, a pipeline was established to transfer the combined 1C/CW waste from the 221-T Plant to tank 241-U-110 in the 241-U Tank Farm. However, this transfer line developed a plug shortly after first being used and the combined 1C/CW waste was transferred to tank 241-T-104 (HW-7-3751-DEL, pages 20 and 21). Tank 241-T-104 was filled with the combined 1C/CW waste in July 1946.(HW-7-4542-DEL, pages 21-22).

Tanks 241-T-104, 241-T-105, and 241-T-106 were originally designated as a spare set of tanks for receipt of second decontamination cycle (2C) waste from the 221-T Plant. Collection of the combined 1C/CW waste in tank 241-T-104 was considered at the time to be a temporary measure. In order to allow the collection of 2C waste from 221-T Plant in tanks 241-T-105 and

241-T-106, a separate transfer pipeline was established to the inlet of tank 241-T-105 on July 17, 1946 (H-2-578 and HAN-45762, pages 27 and 32). Tank 241-T-105 was used to store 2C waste from the 221-T Plant from July 23, 1946 (HW-7-4542-DEL, page 22) through April 1948, after which the 2C supernatant waste was discharged to a crib (HW-9922-DEL, page 31). Tank 241-T-106 began to receive 2C waste through the overflow line from tank 241-T-105 in June 1947 (HW-7-7454-DEL, page 26) and was filled in March 1948 (HW-9595-DEL, page 32). The 2C supernatant waste contained in tank 241-T-106 was discharged to a crib from July 1948 (HW-10714-DEL, page 32) through August 3, 1948 (HW-10993-DEL, page 35).

The plug in the transfer line from 221-T Plant to the 241-U Tank Farm was successfully removed in April 1946 (HW-7-4004-DEL, page 20). The combined 1C/CW waste from 221-T Plant was diverted to the cascade of tanks 241-U-110, 241-U-111, and 241-U-112 on July 22, 1946 (HW-7-4542-DEL, page 21-22). The cascade of tanks 241-U-110, 241-U-111, and 241-U-112 were filled with the 1C/CW waste from the 221-T Plant in May 1948 (HW-10166-DEL, page 33).

After emptying the 2C supernatant waste from tank 241-T-105, the combined 1C/CW waste was transferred from 221-T Plant to tank 241-T-105 beginning in May 1948 (HAN-45807-DEL, page 55). Waste began to cascade from tank 241-T-105 into tank 241-T-106 in August 1948. Tank 241-T-105 continued to receive 1C/CW waste through January 1949, at which tanks 241-T-104, 241-T-105, and 241-T-106 were all filled with 1C/CW waste (HW-12391-DEL, page 38). The 1C/CW waste generated at the 221-T Plant was then transferred to the cascade of tanks 241-TX-109 through 241-TX-112 (HW-12391-DEL, page 38).

2.2.2 1C/CW Supernatant Evaporation (March 1951 – July 1951)

The pH of the 1C/CW waste was adjusted to approximately pH 7 in the 221-T Plant before transfer to the single-shell tanks. This pH adjustment was conducted to cause the precipitation of bismuth and plutonium in the 1C/CW waste so that the supernatant would contain a lower concentration of plutonium (HW-7-2706-DEL, page 21). As a result, tank 241-T-104 contained settled 1C/CW solids (i.e., bismuth and plutonium precipitate) and 1C/CW supernatant (HW-20991-DEL, page 53).

The 1C/CW supernatant contained in tank 241-T-104, along with that contained in the other tanks in 241-T Farm were transferred to tanks 241-TX-117 and 241-TX-118 from March 1951 (HW-20671-Del, page 56) through July 1951 (HW-21802-DEL, page 42). The 1C/CW supernatant was transferred from tanks 241-TX-117 and 241-TX-118 to the 242-T Evaporator for evaporation. Processing of the 1C/CW supernatant from the 241-T Farm tanks in the 242-T Evaporator was conducted from April 28, 1951 (HW-20991-DEL page 54 and HAN-63671, page 40) through July 1951 (HW-21802-DEL, page 42). The concentrated 1C/CW supernatant waste (i.e., evaporator bottoms) was stored in tanks 241-TX-116 and 241-TX-117. The evaporator bottoms in tanks 241-TX-116 and 241-TX-117 were eventually processed again through the 242-T Evaporator to further concentrate these wastes for storage in tanks 241-TX-110 and 241-TX-111.

2.2.3 1C/CW Waste Cascade Filling (August 1951 – December 1951)

After evaporating the 1C/CW supernatant, tank 241-T-104 was again used to store 1C/CW waste from the bismuth phosphate process conducted in 221-T Plant. Tank 241-T-104 was operated as a cascade with tanks 241-T-105 and 241-T-106. Tanks 241-T-104, 241-T-105, and 241-T-106 were reported as being filled with 1C/CW waste in August 1951, October 26, 1951, and December 22, 1951, respectively (HW-33591, page 12).

2.2.4 Trench Disposal of 1C/CW Supernatant (January 1954)

Plans were made to allow the 1C/CW waste to remain in the cascade of tanks 241-T-104, 241-T-105, and 241-T-106 for one-year to allow for the decay of short-lived fission products, after which the supernatant was to be processed in the 242-T Evaporator (HW-27838, page 32). However, evaporation of the supernatant contained in these tanks was not conducted.

Instead, the 1C/CW supernatant contained in tank 241-T-104 was discharged to the east section of trench 241-T-1 (later renamed to trench 216-T-14) on January 14, 1954 (HW-33591, page 12). The 1C/CW supernatant contained in tanks 241-BX-110, 241-BX-111, 241-BX-112, 241-BY-106, 241-BY-110, 241-T-105, 241-T-106, 241-TX-109, 241-TX-110, and 241-TX-111 and 1C/CW evaporator bottoms contained in tanks 241-B-107, 241-B-108, 241-B-109, 241-TY-101 and 241-TY-102 were also discharged to trenches from January 1954 through November 1954 (HW-33591, pages 11 and 12 and HW-38562, pages 10, 28 and 29). The disposal of 1C/CW supernatant to these trenches was based on the concept of retaining fission products, plutonium, and uranium in the soil column. Trench disposal of the 1C/CW supernatant and evaporator bottoms was thought to be an economical method for providing additional capacity in the single-shell tanks for storage of wastes with higher radioactivity (HW-34281).

2.2.5 1C/CW Waste Cascade Filling (February 1954 – October 1954)

Beginning on February 23, 1954, 1C/CW waste was again transferred to tank 241-T-104 (HW-31126, page 5). The tank was filled to approximately 6-inches above the cascade overflow line and waste began to cascade to tank 241-T-105 in March 1954 and to tank 241-T-106 in June 1954. The cascade of tanks 241-T-104, 241-T-105 and 241-T-106 was filled by the end of September 1954 (HW-33396, page 5) and did not receive any additional 1C/CW waste from 221-T Plant.

On October 20, 1954, modifications to the bismuth phosphate process were conducted in 221-T Plant to segregate the coating removal waste (CW) from the first decontamination cycle (1C) waste (HW-33585-DEL, page Ed-8 and HW-33544, page 5). The coating removal waste was transferred directly to tank 241-T-105, which cascaded through the overflow line into tank 241-T-106. Additional storage space for the coating removal waste was provided in tank 241-T-105 by pumping some of the supernatant from tank 241-T-105 to tank 241-TX-118 for processing in the 242-T Evaporator (HW-33904, page 5).

The 1C waste was treated in 221-T Plant with potassium ferrocyanide, nickel sulfate, and sodium hydroxide to precipitate nickel ferrocyanide, which scavenged cesium-137 and strontium-90 from the supernatant (HW-33184 and HW-33499). The treated 1C waste was discharged to tanks 241-TY-101 and 241-TY-103 from October 20, 1954 (HW-33544, page 7) through March 20, 1956, when the final processing of irradiated fuels for plutonium recovery was completed in the 221-T Plant (HW-42219-DEL, page Ed-5). The nickel ferrocyanide precipitate and the scavenged fission products settled in these tanks, with the supernatant transferred in March 1955 to tank 241-TX-118 for processing in the 242-T Evaporator (HW-36001, page 7) and disposal in 216-TY trenches from October 1955 (HW-44784, page 42) through November 1956 (HW-48518, page 34).

After October 20, 1954, tank 241-T-104 was no longer used to receive waste from the 221-T Plant. No other transfers of waste into tank 241-T-104 have occurred.

2.2.6 Saltwell Pumping / Interim Stabilization

The 1C/CW waste remained undisturbed in tank 241-T-104 until July 1969, when approximately 48,000-gallons of supernatant were transferred from tank 241-T-104 to tank 241-TY-103 (ARH-1200 C, page 7).

Removal of additional liquid from tank 241-T-104 was conducted from February 27, 1976 through August 17, 1977 as part of the program to remove interstitial liquid (i.e., saltwell pumping) from the single-shell tanks (letter 60410-78-092 and DS-022676). A total of 38,200 gallons of liquid waste was reported as being pumped from tank 241-T-104 to tank 241-T-101 during this period. In May 1978, saltwell pumping of liquids from tank 241-T-104 was attempted again. However, the pump was reported as inoperable. Saltwell pumping of liquids from tank 241-T-104 was resumed on September 11, 1978 and concluded on December 26, 1978 (DS-022676). An additional 7,420 gallons of liquid waste were transferred from tank 241-T-104 to tank 241-T-101. The height of waste in tank 241-T-104 was reported as 13-feet and 1.25-inches following saltwell pumping. The volume of waste in tank 241-T-104 was approximately 412,000 gallons based on the waste height measurement.

Interim stabilization of tank 241-T-104 was conducted from March 24, 1996 through May 30, 1999 (HNF-EP-0182 revision 172, page B-15). Approximately 150,000 gallons of liquid were pumped from tank 241-T-104 to the double-shell tank system, leaving an estimated 316,800 gallons of sludge in this tank (HNF-SD-RE-TI-178, page 200). Tank 241-T-104 was declared having been interim stabilized on November 19, 1999 (HNF-EP-0182 revision 172, page B-13).

2.2.7 Comparison with Other Reports

Waste transfers into and waste removals from tank 241-T-104 are summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132) for 1945 through 1980, *Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 West Area* (HNF-SD-WM-ER-351), and *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311). The information cited in Sections 2.2.1 through 2.2.10 is in agreement with these previous reports. These previous reports accurately state the volume of waste transferred into and removed from tank 241-T-104, as well as the volume of solids and total waste stored.

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997.*

It has been established in Section 2.0 that first decontamination cycle (1C) waste mixed with coating removal waste (CW) from the 221-T Bismuth Phosphate plant was transferred into tank 241-T-104. The following sections provide a discussion of the wastes originating from the bismuth phosphate plant operations.

3.1 B AND T BISMUTH PHOSPHATE PROCESS PLANTS

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from irradiated nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion. The bismuth phosphate process was operated in B-Plant from April 1945 (HW-7-1649-DEL, page 21) through June 1952 (HW-25227-DEL, pages Ed-5 and Ed-6), after which the inventory of radioactive materials was removed from the facility from July 1952 through March 1953 (HW-27774). The bismuth phosphate process was operated in T-Plant from December 1944 (HAN-45800-DEL, page 4) through March 1956, after which the inventory of radioactive materials was removed from the facility from March 1956 (HW-42219-DEL, page ED-5) through September 1956 (HW-45707-DEL, page D-5). T-Plant was placed in layaway status in October 1956 (HW-46432-DEL, page D-5). T-Plant was re-activated in 1960 and is currently in use for equipment decontamination and storage of commercial irradiated nuclear fuel elements.

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste sometimes referred to as coating waste (CW) was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

Reprocessing of the spent nuclear fuel commenced with the dissolution of the uranium fuel elements. The uranium fuel elements (see item [2] in Figure 2) were dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented uranium precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed three times with water to separate the acidic supernatant from the plutonium precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW). Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). The laboratory tests indicate the percentage of cesium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively.

After separating and washing the plutonium precipitate from the metal waste, reprocessing of spent nuclear fuel was completed in the 221 Plant Bismuth Phosphate process. Plutonium decontamination was conducted in the remainder of the 221 Plant Bismuth Phosphate process. The plutonium-bearing cake was dissolved in nitric acid and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products (e.g., cerium, niobium, ruthenium, and zirconium), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C waste) were transferred to the single-shell tanks. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the bismuth phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids from the first decontamination cycle were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduce the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28).

During operation of B-Plant, the 1C waste was combined with the coating removal waste and transferred to the same single-shell tank. This same practice was conducted in T-Plant from December 1944 through October 19, 1954. Beginning on October 20, 1954, nickel ferrocyanide scavenging of the 1C waste was conducted in T-Plant to precipitate cesium-137 and strontium-90 (HW-33585-DEL, page Ed-8, and HW-33184). The precipitated 1C waste slurry was transferred separate from the coating removal waste to separate single-shell tanks for settling of the precipitate and discharge of the scavenged (i.e., cesium and strontium depleted) supernatant to a crib.

Table 1 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the 221-B/T bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C/CW, and 2C that was stored in single-shell tanks are provided in Tables 2 and 3.

These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Figure 2. Bismuth Phosphate Process Diagram

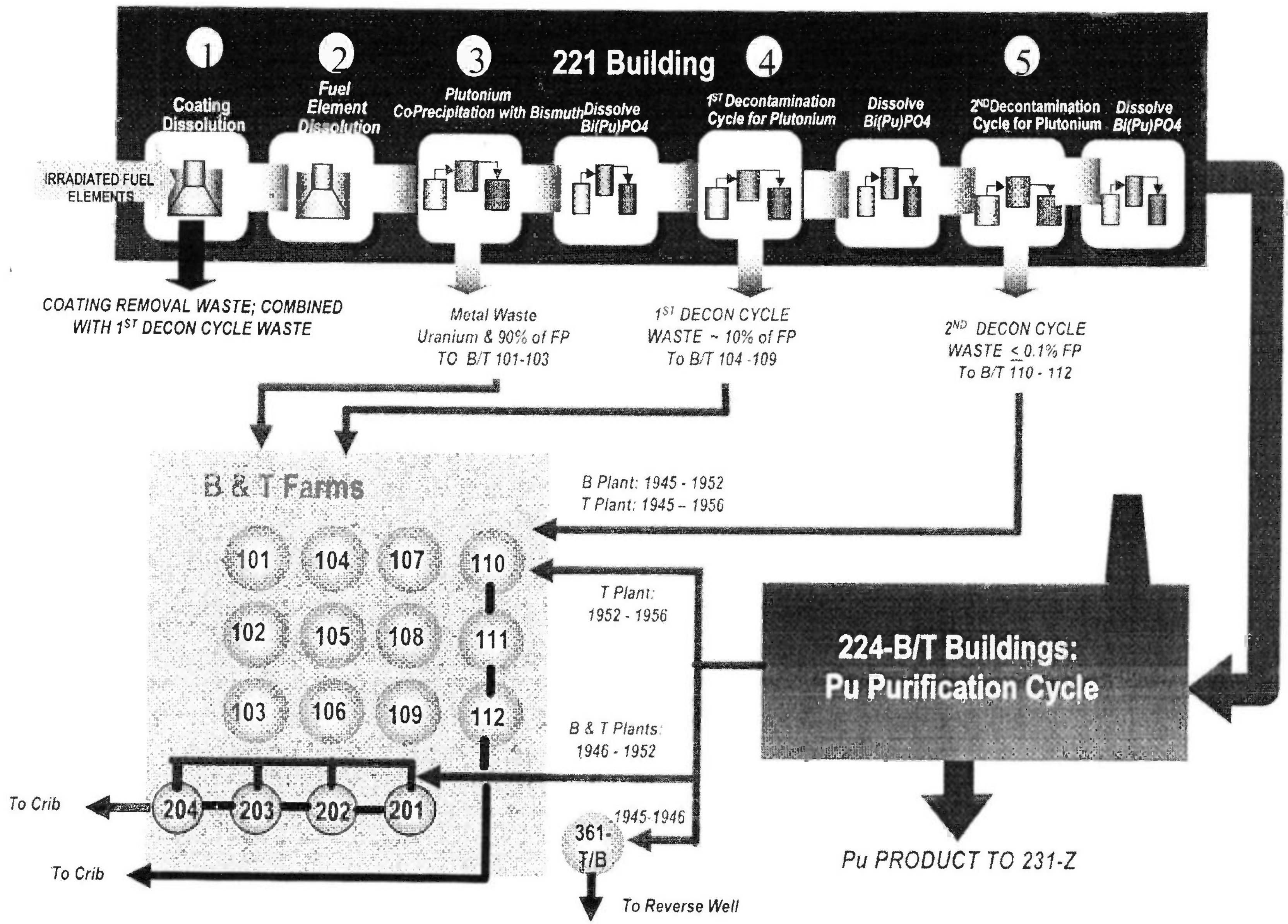


Table 1. Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet [1]

Analyte [2]	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04 [6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02 [6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

[1] See HW-23043.

[2] Analyses are reported in grams per liter, except for gamma activity, which is counts per minute per mL.

[3] HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.

[4] Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).

[5] Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).

[6] Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

Table 2. Analyses of Bismuth Phosphate Process Supernatants Stored [1,2].

Waste Type	Tank	pH	Pu µg per Liter	Gross Beta Millicuries per Liter	Gross Gamma Millicuries per Liter	Date Sampled
Metal Waste	T-101	10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	10	35	110[5]	25[5]	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	.40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? [3]	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µg per Liter**	**Gross Beta Counts per minute per cc**	**Gross Gamma Counts per minute per cc**	**Date Sampled**
2C	T-110	Not reported [4]	15	4.9E+04	30	7-13-1945
2C	T-110	9.8[4]	19	6.9E+04	55	7-25-1945
2C	B-110	9.6[4]	8.5	7.0E+04	55	7-25-1945

Notes:

(1) See HW-10728 and HW-3-3220.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analyses for tank B-112 seem to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 1C and 2C wastes were neutralized to a pH of approximately 10. The waste collected in tanks 241-B-110, 241-B-111, 241-B-112, 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Decreases in gross beta and gross gamma concentrations shown for the T-101 waste samples are due to decay of fission products with short half-lives.

Table 3. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant.

Tank	Date Filled	Pu µg/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y − Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25 8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					0.59	57.3						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) [2]												
B-107	8-1945	1.7E-02	0.135	0 055	0 011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0 044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0 073	0 012	0.17	0 0066	0 047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.012	Not reported	0.0065	0.029	0.0066	0 0024	0	3E-05
T-109	3-1946	2 6E-03	0.14	0 082	0 00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0 01	0 11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0 028	0 010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0 059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0 0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0 069	0 01	0 13						
C-112	4-1947	3.1E-03	0.14	0.064	0 006	0.13						
U-110	4-1947	2.1E-04	0.13	0 069	0.00011	0.17						
U-111	10-1947	3.4E-04	0 12	0 060	0 00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2 8	2.2	0 00087	0.27	0.34	0 0085	0 0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		7.67E-03	0.39	0.22	0.0058	0.15						

Notes:

[1] HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.
[2] HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.
[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e g., Ru, Nb, and Zr) had not decayed appreciably.

3.1.1 221-T and 221-B Plant Cell Drainage Waste

During the operation of the 221-B and 221-T Bismuth Phosphate plants, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B and 221-T Plants contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High-activity waste collected in 221-T Plant and 221-B Plant tanks 5-9 could be jetted to single-shell tanks 241-T-107 and 241-B-107, respectively (HW-10475-C, page 918). Alternatively, the waste could be transferred to process vessels within the 221-T (or 221-B) Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-Del, page 28).

The T-Plant stack drainage waste was also collected as part of the cell drainage until May 28, 1951, after which the stack drainage was routed to the cascade of single-shell tanks 241-TX-113, 241-TX-114, and 241-TX-115 (HW-21260-DEL, page 58). Also, the dissolvers located in 221-B and 221-T Plant cells 5, 6 and 7 were equipped with off-gas scrubber towers in May 1948 (HAN-45807, pages 57). The dissolver off-gas scrubbers used water to adsorb iodine and remove particulates from the dissolver off-gases. The spent scrubber solution was combined with the low-activity cell drainage waste collected in tank 5-6 (HW-10728). The dissolver off-gas scrubbers were replaced with silver chemical reactors, thus eliminating the spent scrubber solution. The first silver reactor was installed in the 221-B Plant in October 24, 1950 (HW-19898 and HW-19325, page 52) and the remaining silver chemical reactors were installed in the 221-B and 221-T Plants by January 1951 (HW-20161, page 52 and HW-21826).

Waste collected in tank 5-6 was transferred to reverse well number 216-T-3 from January 1945 through August 1946. Crib number 216-T-6 was used to dispose of the cell drainage waste from August 1946 through June 1951. After June 1951, cell drainage waste was transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 (HW-55176, part V). The quantity and composition of the cell drainage solutions discharged from tank 5-6 varied (see HW-20583, page 4 and HW-33591, page 25). Table 4 provides analyses of cell drainage waste that was collected in tank 5-6 and transferred to either crib 216-T-6 or to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112. As evident from the analyses provided in Table 5, the neutralized, low-activity cell drainage waste contained soluble beta emitting radionuclides and plutonium.

3.1.2 221-T Equipment Decontamination Facility

In October 1958, plans were developed to convert the 221-T Plant for use as decontamination facility for equipment from the Reduction-Oxidation (REDOX) plant (HW-58051-DEL, page D-5). Work was conducted from February 1959 (HW-59434-DEL, page D-4) through June 1960 (HW-65935-DEL, page C-2) to convert the 221-T Plant. Equipment decontamination activities were initiated at the 221-T Plant in July 1960, with the receipt of a failed multipurpose dissolver from the REDOX plant (HW-66271-DEL, page C-2). Equipment decontamination waste was transferred to single-shell tanks 241-T-111 and 241-T-112 (RPP-13873, section 2.2.4). Tank 241-T-104 did not receive equipment decontamination waste.

Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant. (3 sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
Tank 5-6 Cell Drainage Transferred to 216-T-6 Crib [1,2]					
1948	January	839,900	49	88	Total beta activity does not include radioactive iodine. Samples were measured for total alpha activity. Calculated Pu mass assumes that all alpha activity measured in samples was Pu. Uranium activity in samples contributed less than 8% of the total alpha activity [1].
	February	724,461	8	73	
	March	586,188	3	789	
	April	842,778	9	461	
	May	918,007	5	72	
	June	971,810	9	295	
	July	1,057,015	6	130	
	August	831,662	4	248	
	September	857,327	5	361	
	October	830,083	4	116	
	November	980,411	6	214	
No records could be located for December 1948 through August 1949.					
1949	September	260,000	32	365	
	October	360,000	41	2800	
	November	340,000	38.2	333	
	December	430,000	48	250	
1950	January	410,000	44	210	
	February	330,000	28.5	No data reported	
	March	370,000	35	No data reported	
	April	450,000	35.6	294	
	May	370,000	33.9	363	
	June	430,000	36.6	2142	
	July	520,000	43.6	600	
	August	590,000	44.9	741	
	September	480,000	42.3	850	
	October	620,000	47.3	858	
	November	540,000	50.9	600	
	December	590,000	42.1	850	
No records could be located for January 1951 through December 1951. Beginning in June 1951, Tank 5-6 cell drainage waste along with 2C waste was routed to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112.					

Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant. (3 sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
Tank 5-6 Cell Drainage Waste Discharged to the Cascade of Tanks 241-T-110, 241-T-111, and 241-T-112 [3,4]					
1952	January	595,000	5.2	440	
	February	498,000	6.9	850	
	March	643,000	8.2	920	
	April	623,000	8.8	660	
	May	318,000	1.8	84	
	June	392,000	3.0	97	
	July	600,000	4.1	160	Beginning in July 1952, 224 building waste, along with tank 5-6 cell drainage and 2C wastes were routed to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112. Values reported are for tank 5-6 cell drainage waste only.
	August	670,000	6.5	265	
	September	260,000	1.9	675	
	October	430,000	3.0	310	
	November	490,000	2.7	95	
	December	540,000	3.3	240	
1953	January	490,000	2.4	130	
	February	530,000	3.9	480	
	March	660,000	5.0	245	
	April	390,000	2.0	180	
	May	490,000	1.8	220	
	June	660,000	3.5	590	
	July	280,000	0.9	65	
	August	490,000	2.4	100	
	September	560,000	7.8	195	
	October	560,000	6.8	1,840	
	November	710,000	8.7	1,085	
	December	740,000	8.8	885	
1954	January	830,000	10.4	1,680	
	February	820,000	14.2	16,420	
	March	860,000	18.6	5,305	
	April	540,000	8.4	2,175	
	May	790,000	10.6	1,760	
	June	810,000	9.5	2,390	
	July	1,030,000			Radionuclide content not reported separately for 5-6 Cell drainage waste from July 1954 through June 1955 (HW-38562, page 26).
	August	1,150,000			
	September	1,090,000			
	October	800,000			
	November	730,000			
	December	1,100,000			
1955	January	1,370,000			
	February	950,000			
	March	1,460,000			

Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant. (3 sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
1955	April	1,380,000			
	May	1,410,000			
	June	1,440,000			
The volume and radionuclide content of tank 5-6 cell drainage waste were not recorded separate from other wastes transferred into the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 after July 1954.					

Notes:

(1) HW-11908
(2) HW-20583
(3) HW-25301
(4) HW-33591
(5) Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50% ruthenium, 35 to 50% cesium, 4 to 8% cerium, yttrium, and other rare earths, and 6 to 11% undetermined (HW-27035, page 8).

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANK 241-T-104

The U.S. Department of Energy (DOE) uses several factors to determine the disposition of radioactive wastes (DOE M 435.1). One of these factors is the concentration of alpha-emitting transuranic isotopes with half-life greater than 20 years present in the radioactive waste. Two core samples of the waste stored in tank 241-T-104 were obtained in 1992 for chemical and radiochemical analyses. The results of the chemical and radiochemical analyses along with process waste knowledge are were used to determine the inventory of key analytes and radionuclides present in the tank 241-T-104 waste (i.e. best basis inventory).

Table 5 provides the best-basis inventory for the 1C/CW sludge stored in tank 241-T-104, as reported on October 11, 2004 from the Tank Waste Information Network (TWINS) database; http://twins.pnl.gov/twins.htm . The radionuclide inventory is decay corrected to January 1, 2004. The transuranic elements (i.e., Np-237, Pu-238, Pu-239, Pu-240, and Am-241) are summed and presented in Table 6. The concentrations of transuranic elements in the 1C/CW waste stored in tank 241-T-104 are approximately 159.8 ηCi/g. The concentrations of cesium-137 and strontium-90 present in the 1C/CW waste stored in tank 241-T-104 are also provided in Table 6. The cesium-137 and strontium-90 concentrations are approximately 0.155 µCi/g and 2.03 µCi/g.

The inventories of transuranic elements, cesium-137, and strontium-90 present in tank 241-T-104 are also compared to the inventory of these radionuclides present in all 177 underground storage tanks at the Hanford Site in Table 6. The inventory of transuranic elements present in tank 241-T-104 is approximately 0.12 percent of the total inventory of transuranic elements present in all 177 underground storage tanks at the Hanford Site. The inventories of cesium-137 and strontium-90 present in tank 241-T-104 are approximately 0.00056% and 0.0061% of the total inventory of cesium-137 and strontium-90 present in all 177 underground storage tanks at the Hanford Site.

Table 5. Best-Basis Inventory for Tank 241-T-104 Sludge. (3 sheets)

Analyte	Inventory		Basis	Concentration	
106Ru	4.92E-11	Ci	TE	2.87E-14	µCi/g
113mCd	5.78E-02	Ci	TE	3.37E-05	µCi/g
125Sb	7.72E-04	Ci	TE	4.50E-07	µCi/g
126Sn	4.80E-03	Ci	TE	2.80E-06	µCi/g
129I	5.10E-04	Ci	TE	2.98E-07	µCi/g
134Cs	5.89E-07	Ci	TE	3.43E-10	µCi/g
137Cs	2.40E+02	Ci	S	1.55E-01	µCi/g
137mBa	2.27E+02	Ci	C	1.47E-01	µCi/g
14C	< 6.9E-02	Ci	S	4.46E-05	µCi/g
151Sm	1.01E+02	Ci	TE	5.89E-02	µCi/g
152Eu	3.24E-03	Ci	TE	1.89E-06	µCi/g
154Eu	2.11E+00	Ci	S	1.37E-03	µCi/g
155Eu	1.09E+00	Ci	S	7.07E-04	µCi/g
226Ra	6.33E-06	Ci	TE	3.69E-09	µCi/g
227Ac	5.40E-05	Ci	TE	3.15E-08	µCi/g

Table 5. Best-Basis Inventory for Tank 241-T-104 Sludge. (3 sheets)

Analyte	Inventory		Basis	Concentration	
228Ra	7.10E-11	Ci	TE	4.14E-14	µCi/g
229Th	2.00E-08	Ci	TE	1.17E-11	µCi/g
231Pa	4.04E-04	Ci	TE	2.35E-07	µCi/g
232Th	1.68E-10	Ci	TE	9.80E-14	µCi/g
232U	5.66E-06	Ci	C	3.66E-09	µCi/g
233U	4.71E-07	Ci	C	3.04E-10	µCi/g
234U	6.28E-01	Ci	S	4.06E-04	µCi/g
235U	2.03E-02	Ci	S	1.31E-05	µCi/g
236U	6.06E-03	Ci	S	3.92E-06	µCi/g
237Np	2.20E-03	Ci	TE	1.28E-06	µCi/g
238Pu	2.51E+00	Ci	S	1.63E-03	µCi/g
238U	4.64E-01	Ci	S	3.00E-04	µCi/g
239Pu	1.93E+02	Ci	S	1.25E-01	µCi/g
240Pu	2.33E+01	Ci	S	1.51E-02	µCi/g
241Am	2.80E+01	Ci	S	1.81E-02	µCi/g
241Pu	7.84E+01	Ci	S	5.07E-02	µCi/g
242Cm	4.69E-03	Ci	C	3.04E-06	µCi/g
242Pu	1.15E-03	Ci	S	7.44E-07	µCi/g
243Am	2.76E-03	Ci	C	1.78E-06	µCi/g
243Cm	5.24E-05	Ci	C	3.39E-08	µCi/g
244Cm	1.18E-03	Ci	C	7.63E-07	µCi/g
3H	3.75E-01	Ci	TS	2.19E-04	µCi/g
59Ni	1.24E-02	Ci	TE	7.25E-06	µCi/g
60Co	7.91E-02	Ci	TE	4.61E-05	µCi/g
63Ni	1.72E+00	Ci	TE	1.01E-03	µCi/g
79Se	1.27E-03	Ci	TE	7.42E-07	µCi/g
90Sr	3.14E+03	Ci	S	2.03E+00	µCi/g
90Y	3.14E+03	Ci	C	2.03E+00	µCi/g
93mNb	1.47E+00	Ci	TE	8.59E-04	µCi/g
93Zr	1.63E+00	Ci	TE	9.51E-04	µCi/g
99Tc	9.74E-01	Ci	S	6.30E-04	µCi/g
Al	2.51E+04	kg	S	1.62E+04	µg/g
Bi	2.92E+04	kg	S	1.89E+04	µg/g
Ca	2.24E+03	kg	S	1.45E+03	µg/g
Cl	1.04E+03	kg	S	6.70E+02	µg/g
Cr	1.39E+03	kg	S	9.01E+02	µg/g
F	1.33E+04	kg	S	8.57E+03	µg/g
Fe	1.39E+04	kg	S	9.02E+03	µg/g
Hg	1.94E-01	kg	S	1.25E-01	µg/g
K	1.38E+02	kg	S	8.90E+01	µg/g
La	1.69E+00	kg	TS	9.86E-01	µg/g
Mn	9.56E+01	kg	S	6.18E+01	µg/g
Na	9.98E+04	kg	S	6.45E+04	µg/g
Ni	1.75E+01	kg	S	1.13E+01	µg/g
NO2	6.55E+03	kg	S	4.24E+03	µg/g

Table 5. Best-Basis Inventory for Tank 241-T-104 Sludge. (3 sheets)

Analyte	Inventory		Basis	Concentration	
NO3	8.97E+04	kg	S	5.80E+04	µg/g
Oxalate	1.01E+03	kg	C	5.88E+02	µg/g
Pb	7.70E+01	kg	S	4.98E+01	µg/g
PO4	1.14E+05	kg	S	7.35E+04	µg/g
Si	1.01E+04	kg	S	6.52E+03	µg/g
SO4	5.92E+03	kg	S	3.83E+03	µg/g
Sr	1.53E+02	kg	S	9.91E+01	µg/g
TIC as CO3	7.73E+02	kg	S	5.00E+02	µg/g
TOC	5.23E+02	kg	TS	3.05E+02	µg/g
UTOTAL	1.39E+03	kg	S	8.97E+02	µg/g
Zr	1.04E+02	kg	S	6.75E+01	µg/g

Notes:

Radionuclides are decay corrected to January 1, 2004
S – Sample based
C – Calculated
TE – Based on a Hanford Defined Waste model or engineering based waste template
TS – Based on a sample based waste template

Table 6. Transuranic Elements and Fission Products in Tank 241-T-104.

Tank	TRU		Cs-137		Sr-90	
	ηCi/g	Ci	µCi/g	Ci	µCi/g	Ci
241-T-104	159.8	246.8	0.155	240	2.03	3,140
All 177 Tanks	Not applicable	214,067	Not applicable	43,000,000	Not applicable	51,900,000
241-T-104 waste as a percentage of all 177 tanks		0.12%		5.6E-04%		6.1E-03%

Note: TRU = transuranic

5.0 SUMMARY

Tank 241-T-104 received only first decontamination cycle (1C) waste and coating removal waste (CW) from operations of the bismuth phosphate process conducted in the 221-T Plant. The transfer of 1C/CW waste into tank 241-T-104 was conducted periodically from March 11, 1946 through October 19, 1956.

The pH of the 1C/CW waste was adjusted to approximately pH 7 in the 221-T Plant before transfer to the single-shell tanks. This was done to cause the precipitation of bismuth and plutonium in the 1C/CW waste so that the supernatant would contain a lower concentration of plutonium. As a result, tank 241-T-104 contained settled 1C/CW solids (i.e., bismuth and plutonium precipitate) and 1C/CW supernatant.

The 1C/CW sludge was allowed to settle in tank 241-T-104. The 1C/CW supernatant was removed from tank 241-T-104 and either processed in the 242-T Evaporator (April through July 1951) or disposed in the east section of trench 216-T-14 (January 14, 1954). The interstitial liquid was removed from the 1C/CW sludge present in tank 241-T-104 and transferred to other underground storage tanks in two campaigns conducted February 1976 to August 1977 and March 24, 1996 to May 30, 1999.

The concentration of transuranic elements present in the 1C/CW sludge contained in tank 241-T-104 is approximately 159.8 ηCi/g. The concentrations of cesium-137 and strontium-90 in the 1C/CW sludge contained in tank 241-T-104 are approximately 0.155 µCi/g and 2.03 µCi/g, decay corrected to January 1, 2004.

6.0 REFERENCES

60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey, RHO, May 17), Rockwell Hanford Operations, Richland, Washington.

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, CH2M HILL, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

DOE M 435.1-1, 1999, *Radioactive Waste Management Manual,* U. S. Department of Energy, Washington, D.C.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997,* Rev. 0, available at http://www.hanford.gov/doc/culrcs/mpd/toc.htm, U. S. Department of Energy, Richland Operations Office, Richland, Washington.

DS-022676, 1978, *Data Sheets Salt Well Transfer Tank T104 to T101 [02/26/1976 through 12/26/1978],* Accession number D196234770.

H-2-578, 1973, *Waste Disposal System Plan & Details 241-T & 216-T-32, T-7,* Rev. 5, E. I. Du Pont De Nemours Company, Richland, Washington.

H-2-755, 1948, *Schematic Layout 200-W Area 241 Bldgs,* Rev. 1, General Electric Company, Richland, Washington.

HAN-45762, 1946, *200 Area Daily Log for June 3, 1946 through December 31, 1946,* E. I. Du Pont De Nemours Company, Richland, Washington.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944 through December 1946,* Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-45807-DEL, 1948, *200 Area Monthly Reports 1948,* Atomic Energy Commission, Richland Operations Office, Richland, Washington.

HAN-63671-DEL, 1951, *200 Area Monthly Reports for January 1, 1951 to December 31, 1951,* Atomic Energy Commission Richland Operations Office, Richland, Washington.

HNF-EP-0182, 2002, *Waste Tank Summary Report for Month Ending July 31, 2002*, Rev. 172, CH2M HILL Hanford Group, Inc., Richland, Washington.

HNF-SD-RE-TI-178, 2003, *Single-Shell Tank Leak Stabilization Record*, Rev. 8, CH2M HILL Hanford Group, Inc., Richland, Washington.

HNF-SD-WM-ER-351, 1997, *Historical Tank Waste Content Estimate for the Northwest Quadrant of the Hanford 200 West Area*, Rev. 1, Fluor Daniel Northwest, Inc., Richland, Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1338-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10728, 1948, *Process Waste Data – 200 Areas*, (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.

HW-11908, 1948, *Audit of Radioactive Waste to Ground through the 5-6 Crib Systems (January Through November 1948)*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington

HW-19898, 1951, *Efficiency Evaluation of the Dissolver Cell Silver Reactor and Fiberglas Filter*, General Electric Company, Richland, Washington

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.

HW-21826, 1951, *Variation in Silver Reactor Performance*, General Electric Company, Richland, Washington

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-25301, 1952, *Process Waste Disposal Summary – 200 Areas January through June 1952*, General Electric Company, Richland, Washington.

HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.

HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-33184, 1954, *BiPO4 Plant Nickel Ferrocyanide Scavenging Flowsheet for First Cycle Waste Containing No Coating Removal Waste*, General Electric Company, Richland, Washington.

HW-33499, 1954, *Justification for T Plant First Cycle Waste Scavenging*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Subsection, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, November 30, 1954*, General Electric Company, Richland, Washington.

HW-34281, 1954, *First Cycle Supernatant Ground Disposal*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities through June 1955*, General Electric Company, Richland, Washington.

HW-44784, 1956, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities through June 1956*, General Electric Company, Richland, Washington.

HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities through December 1956*, General Electric Company, Richland, Washington.

HW-55176 – Pt. V, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.

HW-33585-DEL, 1954 *Hanford Atomic Products Operation Monthly Report for October 1954*, General Electric Company, Richland, Washington.

HW-42219-DEL, 1956, *Hanford Atomic Products Operation for March 1956*, General Electric Company, Richland, Washington.

HW-45707-DEL, 1956, *Chemical Processing Department Monthly Report for September 1956*, General Electric Company, Richland, Washington.

HW-46432-DEL, 1956, *Chemical Processing Department Monthly Report for October 1956*, General Electric Company, Richland, Washington.

HW-58051-DEL, 1958, *Chemical Processing Department Monthly Report for October 1958*, November 21, 1958, General Electric Company, Richland, Washington.

HW-59434-DEL, 1959, *Chemical Processing Department Monthly Report for February 1959*, General Electric Company, Richland, Washington.

HW-65935-DEL, 1960, *Chemical Processing Department Monthly Report for June 1960*, General Electric Company, Richland, Washington.

HW-66271-DEL, 1960, *Chemical Processing Department Monthly Report for July 1960*, General Electric Company, Richland, Washington.

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

RPP-13873, 2003, Origin of Wastes in Single-shell Tanks 241-T-110 and 241-T-111, M. E. Johnson, CH2M Hill Hanford Group Inc., Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

VOLUME OF WASTE IN TANK 241-T-104

January 1945 through May 1977

Table A-1. VOLUME OF WASTES IN TANK 241-T-104

Year	Month	Percentage filled	Reference	Page	Comments
1945	January	Empty	HW-7-1293-DEL		No waste transferred into tank 241-T-104.
	February	Empty	HW-7-1388-DEL	18	No waste transferred into tank 241-T-104. 1C/CW waste from 221-T Plant collected into cascade of tanks 241-T-107, 241-T-108, and 241-T-109.
	March	Empty	HW-7-1544-DEL	21	Same as above.
	April	Empty	HW-7-1649-DEL	20	Same as above.
	May	Empty	HW-7-1793-DEL	22	Same as above.
	June	Empty	HW-7-1981-DEL	23	Same as above.
	July	Empty	HW-7-2177-DEL	22	Same as above.
	August	Empty	HW-7-2361-DEL	21	Same as above.
	September	Empty	HW-7-2548-DEL	22	Same as above.
	October	Empty	HW-7-2706-DEL	21	No waste transferred into tank 241-T-104. 1C/CW waste being adjusted to pH 7 before discharge to cascade of tanks 241-T-107, 241-T-108, and 241-T-109.
	November	Empty	HW-7-2957-DEL	21	Same as above.
	December	Empty	HW-7-3171-DEL	21	Same as above.
					Same as above.
1946	January	0% [1]	HW-7-3378-DEL	24	Same as above.
	February	0% [1]	HW-7-3566-DEL	21	Same as above.
	March	3.1% [1]	HW-7-3751-DEL	20 - 21	Tanks 241-T-107, 241-T-108, and 241-T-109 are filled with 1C/CW waste. 1C/CW waste from 221-T Plant diverted to tank 241-U-110 on March 11, 1946. However, transfer line developed a plug. 1C/CW waste was then diverted to tank 241-T-104.
	April	12.9% [1]	HW-7-4004-DEL	20 - 21	1C/CW waste transfer line from 221-T Plant to 241-U Farm (tank 241-U-110) was unplugged. 1C/CW waste from 221-T Plant still being collected in tank 241-T-1104.
	May	19.7% [1]	HW-7-4193-DEL	21	Receiving 1C/CW waste from 221-T Plant into tank 241-T-104
	June	29.2% [1]	HW-7-4343-DEL	23	Receiving 1C/CW waste from 221-T Plant into tank 241-T-104
	July	100% [2]	HW-7-4542-DEL	21 - 22	Receiving 1C/CW waste from 221-T Plant into tank 241-T-104. Tank 241-T-104 filled and 1C/CW waste diverted to tank 241-U-110 on July 22, 1946. Completed on July 22, 1946 the tie-in of new underground pipeline from diversion box 241-T-153 to tank 241-T-105, which permitted the diversion of 2C waste into tank 241-T-105.

Table A-1. VOLUME OF WASTES IN TANK 241-T-104

Year	Month	Percentage filled	Reference	Page	Comments
	August	100% [2]	HW-7-4739-DEL	23	Tank 241-T-104 filled. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112. Tanks 241-T-105 and 241-T-106 being used to receive 2C waste from 221-T Plant.
	September	100% [2]	HW-7-5194-DEL	26	Same as above.
	October	100% [2]	HW-7-5362-DEL	28	Same as above.
	November	100% [2]	HW-7-5505-DEL	28	Same as above.
	December	100% [2]	HW-7-5630-DEL	25	Same as above.
		100% [2]			Same as above.
1947	January	100% [2]	HW-7-5802-DEL	26	Same as above.
	February	100% [2]	HW-7-5944-DEL	25	Same as above.
	March	100% [2]	HW-7-6048-DEL	23 - 24	Same as above. pH of 1C/CW waste supernatant being received in tank 241-U-110 measured to be between 9 and 10, slightly above target value of pH 7.
	April	100% [2]	HW-7-6184-DEL	26	Same as above. Reduced the amount of caustic solution added t the 1C/CW waste in 221-T Plant to lower the pH to the target value of pH 7, which promotes precipitation of bismuth and plutonium.
	May	100% [2]	HW-7-6391-DEL	23 – 24	Tank 241-T-104 filled. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112. Tanks 241-T-105 and 241-T-106 being used to receive 2C waste from 221-T Plant.
	June	100% [2]	HW-7-7454-DEL	26	Same as above.
	July	100% [2]	HW-7283-DEL	26	Same as above.
	August	100% [2]	HW-7504-DEL	27	Same as above.
	September	100% [2]	HW-7795-DEL	27	Same as above.
	October	100% [2]	HW-7997-DEL	27	Same as above.
	November	100% [2]	HW-8267-DEL	29	Same as above.
	December	100% [2]	HW-8438-DEL	27	Same as above.

Table A-1. VOLUME OF WASTES IN TANK 241-T-104

Year	Month	Percentage filled	Reference	Page	Comments
1948	January	100% [2]	HW-8931-DEL	28	Tank 241-T-104 filled. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112. Tanks 241-T-105 and 241-T-106 being used to receive 2C waste from 221-T Plant.
	February	100% [2]	HW-9191-DEL	29 - 30	Same as above.
	March	100% [2]	HW-9595-DEL	32	Tank 241-T-104 filled. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112. Tanks 241-T-105 and 241-T-106 filled with 2C waste from 221-T Plant.
	April	67.1% [3]	HW-9922-DEL	31 - 32	Tank 241-T-104 filled. 1C/CW waste from 221-T Plant diverted to cascade of tanks 241-U-110, 241-U-111, and 241-U-112. Cribbed 360,000-gallons of 2C supernatant from tank 241-T-105. Tank 241-T-106 still contains 2C waste.
	May	76.2% [3]	HW-10166-DEL	33	241-U-110, 241-U-111, and 241-U-112 are filled with 1C/CW waste. 1C/CW waste from 221-T Plant diverted to tank 241-T-105. Tank 241-T-104 filled with 1C/CW waste. Tank 241-T-106 still contains 2C waste.
	June	85.8% [3]	HW-10378-DEL	30	Same as above.
	July	69.0% [1]	HW-10714-DEL	32 - 33	Same as above. Starting jetting 2C waste from tank 241-T-106 to crib.
	August	70.3% [1]	HW-10993-DEL	35 - 36	Completed jetting 2C waste from tank 241-T-106 to crib on August 3, 1948. Tank 241-T-105 receiving 1C/CW waste from 221-T Plant.
	September	74.0% [1]	HW-11226-DEL	33	1C/CW waste from 221-T Plant diverted to tank 241-T-105, which cascades to tank 241-T-106. Tank 241-T-104 filled with 1C/CW waste.
	October	79.0% [1]	HW-11499-DEL	34	Same as above.
	November	85.0% [1]	HW-11835-DEL	36	Same as above.
	December	94.0% [1]	HW-12086-DEL	37	Same as above.

Table A-1. VOLUME OF WASTES IN TANK 241-T-104

Year	Month	Percentage filled	Reference	Page	Comments
1949	January	100% [1]	HW-12391-DEL	38 - 39	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 filled with 1C/CW waste from 221-T Plant. Jumper changes made in diversion boxes 241-TX-153, 241-TX-154, and 241-TX-155 to divert 1C/CW waste from 221-T Plant to cascade of tanks 241-TX-109, 241-TX-110, 241-TX-111., and 241-TX-112.
	February	100% [1]	HW-12666-DEL	35	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 filled with 1C/CW waste from 221-T Plant.
	March	100% [1]	HW-12937-DEL	40 – 41	Same as above.
	April	100% [1]	HW-13190-DEL	40	Same as above.
	May	100% [1]	HW-13561-DEL	42	Same as above.
	June	100% [1]	HW-13793-DEL	41	Same as above.
	July	100% [1]	HW-14043-DEL	43	Same as above.
	August	100% [1]	HW-14338-DEL	44	Same as above.
	September	100% [1]	HW-14596-DEL	43	Same as above.
	October	100% [1]	HW-14916-DEL	43	Same as above.
	November	100% [1]	HW-15267-DEL	45	Same as above.
	December	100% [1]	HW-15550-DEL	43	Same as above.
1950	January	100% [1]	HW-15843-DEL	45	Same as above.
	February	100% [1]	HW-17056-DEL	45	Same as above.
	March	100% [1]	HW-17410-DEL	49	Same as above.
	April	100% [1]	HW-17660-DEL	47	Same as above.
	May	100% [1]	HW-17971-DEL	45	Same as above.
	June	100% [1]	HW-18221-DEL	45	Same as above.
	July	100% [1]	HW-18473-DEL	46	Same as above.
	August	100% [1]	HW-18740-DEL	50	Same as above.
	September	100% [1]	HW-19021-DEL	49	Same as above.
	October	3,170,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-19325-DEL	50	Same as above.
	November	3,170,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-19622-DEL	49	Same as above.
	December	3,170,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-19842-DEL	51	Same as above.

Table A-1. VOLUME OF WASTES IN TANK 241-T-104

Year	Month	Percentage filled	Reference	Page	Comments
1951	January	3,170,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-20161-DEL	50	Same as above.
	February	3,170,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-20438-DEL	50	Same as above.
	March	3,145,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-20671-DEL	54 - 56	Transferred about 25,000-gallons of 1C/CW waste from one of the T-Farm tanks to TX tank in preparation for evaporation in the 242-T Evaporator.
	April	2,055,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-20991-DEL	52 - 53	Transferred about 1,115,000-gallons of 1C/CW waste from tanks 241-T-104, 241-T-105, and 241-T-106 to tanks 241-TX-117 and 241-TX-118 in preparation for evaporation in the 242-T Evaporator. An estimated 470,000-gallons of sludge remain in tanks 241-T-104, 241-T-105, and 241-T-106.
	May	1,770,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-21260-DEL	56 - 58	242-T Evaporator started up in later part of April 1951. A total of 189,046-gallons of 1C/CW waste processed through May 1948. A total of 1,379,000-gallons of 1C/CW waste transferred from 241-T Farm to 241-TX farm as feed for 242-T evaporator.
	June	1,345,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-21506-DEL	55 - 57	A total of 406,568-gallons of 1C/CW waste processed in June 1948 in the 242-T Evaporator. A total of 1,908,625-gallons of 1C/CW waste transferred from 241-T Farm to 241-TX farm as feed for 242-T Evaporator.
	July	792,000-gallons of 1C/CW waste in tanks T-104 thru T-109	HW-21802-DEL	41 - 42	A total of 539,083-gallons of 1C/CW waste processed in July 1948 in the 242-T Evaporator. A total of 2,296,125-gallons of 1C/CW waste transferred from 241-T Farm to 241-TX farm as feed for 242-T Evaporator. This completes the processing of settled 1C/CW waste supernatant from 241-T farm in the 242-T Evaporator.
	August	Not Reported	HW-22075-DEL		
	September	Not Reported	HW-22304-DEL		
	October	Not Reported	HW-22610-DEL		
	November	Not Reported	HW-22875-DEL		
	December	Not Reported	HW-23140-DEL		

[1] Percentage of tanks 241-T-104, 241-T-105, and 241-T-106 filled with waste. Three tanks combined can retain nominally 1,590,000-gallons of waste.
[2] Percentage of tank 241-T-104 filled with waste. Tank can retain nominally 530,000-gallons of waste.
[3] Percentage of tanks 241-T-104 and 241-T-105 filled with waste. Tanks can retain nominally 1,060,000-gallons of waste.

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
1952	January	Not Reported	Not Reported	HW-23437-DEL		
	February	Not Reported	Not Reported	HW-23698-DEL		
	March	Not Reported	Not Reported	HW-23982-DEL		
	April	530,000	Not Reported	HW-27838	10	
	May	530,000	Not Reported	HW-27838	21	
	June	530,000	Not Reported	HW-27838	32	Cascade of tanks 241-T-104, 241-T-105, and 241-T-106 were filled on March 31, 1952. This is the next and last cascade of 1C/CW waste to be evaporated in the 200 West Area. Evaporation is planned to occur after sufficient allowance for aging (radioactivity decay).
	July	530,000	Not Reported	HW-27839	10	Contents of cascade will be aged one year (to decay shot-lived radionuclides), until March 31, 1953.
	August	530,000	Not Reported	HW-27839	21	Contents of cascade will be aged one year (to decay shot-lived radionuclides), until March 31, 1953, after which time evaporation will be started.
	September	530,000	Not Reported	HW-27839	32	Same as above.
	October	530,000	Not Reported	HW-27840	10	Same as above.
	November	530,000	Not Reported	HW-27840	21	Same as above.
	December	530,000	Not Reported	HW-27840	32	Same as above.
1953	January	530,000	Not Reported	HW-27841	10	Sludge measurements taken.
	February	153,000	377,000	HW-27842	10	
	March	153,000	377,000	HW-27775	10	
	April	153,000	377,000	HW-28043	5	
	May	153,000	377,000	HW-28377	5	
	June	153,000	377,000	HW-28712	5	
	July	153,000	377,000	HW-29054	5	
	August	153,000	377,000	HW-29242	5	
	September	153,000	377,000	HW-29624	5	
	October	153,000	377,000	HW-29905	5	
	November	153,000	377,000	HW-30250	5	

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
	December	153,000	377,000	HW-30498	5	
1954	January	153,000	377,000	HW-30851	5	Instead of processing in the 242-T Evaporator, Transferred approximately 121,687-gallons of supernatant from tank 241-T-104 to east portion of trench 241-T-1 (renumbered to 216-T-14) on January 15, 1954. Estimated inventories of Cs-137, Sr-90, Pu-239, and U disposed to trench were 230-curies, 1.0-curies, 0.36-grams, and 14,500-grams, respectively (HW-33591, page 12 and HW-38562, page 28). Supernatant in tanks 241-T-105 and 241-T-106 were also discharged to trenches.
	February	66,000	377,000	HW-31126	5	Started receiving T-Plant 1C/CW waste on February 23, 1954.
	March	169,000	377,000	HW-31374	5	Tank 241-T-104 is filled to approximately 6-inches above overflow. Started cascading to tank 241-T-105. Pump in tank 241-T-106 that discharges to trench has a broken shaft and needs to be repaired.
	April	104,000	442,000	HW-31811	5	Tank 241-T-104 is filled to approximately 6-inches above overflow. T-Plant active 1C/CW waste cascade. 1C/CW waste scheduled to be pumped to trench in May 1954, but not conducted.
	May	68,000	478,000	HW-32110	5	Same as above.
	June	38,000	508,000	HW-32389	5	T-Plant active 1C/CW waste cascade. Tank 241-T-106 started to receive 1C/CW waste from cascade on June 17, 1954.
	July	104,000	442,000	HW-32697	5	T-Plant active 1C/CW waste cascade.
	August	5,000	525,000	HW-33002	5	
	September	5,000	525,000	HW-33396	5	
	October	5,000	525,000	HW-33544	5	Plan to pump waste in cascade to tank 241-TX-118. Started scavenging 1C waste in T Plant on October 20, 1954 to precipitate Cs-137 and Sr-90 before discharge of supernatant to single-shell tanks (HW-33585-DEL, page Ed-8).
	November	5,000	525,000	HW-33904	5	Pumping supernatant from 241-T-105 to 241-TX-118 to provide space for storage of coating removal waste from T-Plant
	December	5,000	525,000	HW-34412	5	

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
1955	January	5,000	525,000	HW-35022	5	
	February	5,000	525,000	HW-35628	5	
	March	5,000	525,000	HW-36001	5	
	April	5,000	525,000	HW-36553	5	
	May	5,000	525,000	HW-37143	5	
	June	5,000	525,000	HW-38000	5	
	July	5,000	525,000	HW-38401	5	
	August	5,000	525,000	HW-38926	5	
	September	5,000	525,000	HW-39216	5	
	October	5,000	525,000	HW-39850	5	
	November	5,000	525,000	HW-40208	5	
	December	5,000	525,000	HW-40816	5	
1956	January	5,000	525,000	HW-41038	5	
	February	5,000	525,000	HW-41812	5	
	March	5,000	525,000	HW-42394	5	
	April	5,000	525,000	HW-42993	5	
	May	5,000	525,000	HW-43490	5	
	June	5,000	525,000	HW-43895	5	
	July	5,000	525,000	HW-44860	5	
	August	5,000	525,000	HW-45140	5	
	September	5,000	525,000	HW-45738	5	
	October	5,000	525,000	HW-46382	5	
	November	5,000	525,000	HW-47052	5	
	December	5,000	525,000	HW-47460	5	
1957	January	15,000	525,000	HW-48144	5	Latest electrode reading of sludge and liquid.
	February	13,000	525,000	HW-48846	5	Latest electrode reading of sludge and liquid.
	March	16,000	525,000	HW-49523	5	Latest electrode reading of sludge and liquid.
	April	18,000	523,000	HW-50127	5	
	May	13,000	525,000	HW-50617	5	Latest electrode reading of sludge and liquid.
	June	13,000	525,000	HW-51348	5	
	July	13,000	525,000	HW-51858	5	
	August	13,000	525,000	HW-52414	5	

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
	September	13,000	525,000	HW-52932	5	
	October	13,000	525,000	HW-53573	5	
	November	13,000	525,000	HW-54067	5	
	December	13,000	525,000	HW-54519	5	
1958	January	13,000	525,000	HW-54916	5	
	February	13,000	525,000	HW-55264	5	
	March	13,000	525,000	HW-55630	5	
	April	13,000	525,000	HW-55997	5	
	May	13,000	525,000	HW-56357	5	
	June	13,000	525,000	HW-56761	5	
	July	13,000	525,000	HW-57122	5	
	August	13,000	525,000	HW-57550	5	
	September	13,000	525,000	HW-57711	5	
	October	13,000	525,000	HW-58201	5	
	November	13,000	525,000	HW-58579	5	
	December	13,000	525,000	HW-58831	5	
1959	January	13,000	525,000	HW-59204	5	
	February	13,000	525,000	HW-59586	5	
	March	13,000	525,000	HW-60065	5	
	April	13,000	525,000	HW-60419	5	
	May	13,000	525,000	HW-60738	5	
	June	13,000	525,000	HW-61095	5	
	July	13,000	525,000	HW-61582	5	
	August	13,000	525,000	HW-61952	5	
	September	13,000	525,000	HW-62421	5	
	October	13,000	525,000	HW-62723	5	
	November	13,000	525,000	HW-63083	5	
	December	13,000	525,000	HW-63559	5	
1960	January	13,000	525,000	HW-63896	5	
	February	13,000	525,000	HW-64373	5	
	March	13,000	525,000	HW-64810	5	
	April	13,000	525,000	HW-65272	5	

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
	May	13,000	525,000	HW-65643	5	
	June	13,000	525,000	HW-66187	5	
	July	13,000	525,000	HW-66557	5	
	August	13,000	525,000	HW-66827	5	
	September	13,000	525,000	HW-67696	5	
	October	13,000	525,000	HW-67705	5	
	November	13,000	525,000	HW-68291	5	
	December	13,000	525,000	HW-68292	5	
1961	January thru June	13,000	525,000	HW-71610	5	
	July thru December	13,000	525,000	HW-72625	5	
1962	January thru June	10,000	525,000	HW-74647	5	Latest electrode reading of sludge and liquid.
	July thru December	10,000	525,000	HW-76223	5	
1963	January thru June	10,000	525,000	HW-78279	5	
	July thru December	10,000	525,000	HW-80379	5	
1964	January thru June	10,000	525,000	HW-83308	5	
	July thru December	10,000	525,000	RL-SEP-260	5	
1965	January thru June	44,000	488,000	RL-SEP-659	5	Sludge probably settled in the tank, resulting in reduced volume.
	July thru September	44,000	488,000	RL-SEP-821	5	
	October thru December	44,000	488,000	RL-SEP-923	5	
1966	January thru March	44,000	488,000	ISO-226	5	
	April thru June	44,000	488,000	ISO-404	5	
	July thru September	44,000	488,000	ISO-538	5	
	October thru December	44,000	488,000	ISO-674	5	
1967	January thru March	44,000	488,000	ISO-806	5	
	April thru June	44,000	488,000	ISO-967	5	
	July thru September	44,000	488,000	ARH-95	6	
	October thru December	44,000	488,000	ARH-326	6	
1968	January thru March	44,000	488,000	ARH-534	6	
	April thru June	44,000	488,000	ARH-721	6	
	July thru September	44,000	488,000	ARH-871	6	
	October thru December	44,000	488,000	ARH-1061	7	
1969	January thru March	43,000	488,000	ARH-1200 A	7	

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
	April thru June	43,000	488,000	ARH-1200 B	7	
	July through September	0	483,000	ARH-1200 C	7	Transferred 48,000-gallons of supernatant to tank 241-TY-103. Waste from other T Farm tanks collected in tank 241-TY-103 was transferred to tank 241-TX-118 and then processed in the 242-T Evaporator.
	October thru December	0	483,000	ARH-1200 D	7	
1970	January thru March	0	483,000	ARH-1666 A	7	
	April thru June	0	483,000	ARH-1666 B	7	
	July thru September	0	482,000	ARH-1666 C	7	
	October thru December	0	483,000	ARH-1666 D	7	
1971	January thru March	0	482,000	ARH-2074 A	7	
	April thru June	0	483,000	ARH-2074 B	7	
	July thru September	0	483,000	ARH-2074 C	7	
	October thru December	0	483,000	ARH-2074 D	7	
1972	January thru March	0	483,000	ARH-2456 A	6	
	April thru June	0	483,000	ARH-2456 B	6	
	July thru September	0	483,000	ARH-2456 C	6	
	October thru December	0	483,000	ARH-2456 D	6	
1973	January thru March	0	483,000	ARH-2794 A	6	
	April thru June	0	483,000	ARH-2974 B	6	
	July thru September	0	483,000	ARH-2974 C	6	
	October thru December	0	483,000	ARH-2974 D	6	
1974	January thru March	0	483,000	ARH-CD-133 A	6	
	April thru June	0	483,000	ARH-CD-133 B	6	
	July thru September	0	483,000	ARH-CD-133 C	6	
	October thru December	0	483,000	ARH-CD-133 D	6	Quarterly report states tank 241-T-104 is "salt filled".
1975	January thru March	0	483,000	ARH-CD-336 A	6	Quarterly report states tank 241-T-104 is "salt filled".
	April thru June	0	483,000	ARH-CD-336 B	6	
	July thru September	0	483,000	ARH-CD-336 C	6	Quarterly report states tank 241-T-104 is "salt filled".
	October thru December	0	483,000	ARH-CD-336 D	6	Quarterly report states tank 241-T-104 is "salt filled".
1976	January thru March	0	483,000	ARH-CD-702 A	6	"Salt filled." Transferred 15,000-gallons of saltwell liquor to tank 241-T-101.

Table A-1. VOLUME OF WASTE IN TANKS 241-T-104

Year	Month	Supernatant (Gallons)	Sludge (Gallons)	Reference	Page	Comments [In general, these are the comments reporting the reference document]
	April thru June	0	483,000	ARH-CD-702 B	6	Removed from service. Salt filled.
	September	0	483,000	ARH-CD-702 I	14	Tank is inactive and salt filled. Saltwell pumping conducted.
	October	0	483,000	ARH-CD-822-OCT	15	Tank is inactive and salt filled. Saltwell pumping conducted.
	November	0	483,000	ARH-CD-822-NOV	15	Tank is inactive. Saltwell pumping conducted.
	December	0	483,000	ARH-CD-822-DEC	17	Tank is inactive. Saltwell pumping conducted.
1977	January	0	483,000	ARH-CD-822-JAN	17	Tank is inactive. Saltwell pumping conducted.
	February	0	483,000	ARH-CD-822-FEB	17	Tank is inactive. Saltwell pumping conducted.
	March	0	483,000	ARH-CD-822-MAR	17	Tank is inactive. Saltwell pumping conducted.
	April	0	483,000	ARH-CD-822-APR	17	Tank is inactive. Saltwell pumping conducted.
	May	0	483,000	ARH-CD-822-MAY	17	Tank is inactive. Saltwell pumping conducted.

REFERENCES

ARH-95, 1967, *Chemical Processing Division Waste Status Summary, July to September*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary, October 1, 1967 through December 31, 1967,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary, January 1, 1968 through March 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary, April 1, 1968 through June 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary, July 1, 1968 through September 30, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary, October 1, 1968 through December 31, 1968,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200A, 1969, *Chemical Processing Division Waste Status Summary, January 1, 1969 through March 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary, April 1, 1969 through June 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary, July 1, 1969 through September 30, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary, October 1, 1969 through December 31, 1969,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary, January 1, 1970 through March 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary, April 1, 1970 through June 30, 1970*Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary, July 1, 1970 through September 30, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary, October 1, 1970 through December 31, 1970,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary, January 1, 1971 through March 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary, April 1, 1971 through June 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, 1970, *Chemical Processing Division Waste Status Summary, July 1, 1971 through September 30, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary, October 1, 1971 through December 31, 1971,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary, January 1, 1973 through March 31,* 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary, April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary, July 1, 1973 through September 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 A, 1976, *Production and Waste Management Division Waste Status Summary January 1, 1976 through March 31, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 B, 1976, *Production and Waste Management Division Waste Status Summary April 1, 1976 through June 30, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-702 I, 1976, *Production and Waste Management Division Waste Status Summary September 30, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-OCT, 1976, *Production and Waste Management Division Waste Status Summary October 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-NOV, 1976, *Production and Waste Management Division Waste Status Summary November 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-DEC, 1976, *Production and Waste Management Division Waste Status Summary December 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-JAN, 1977, *Production and Waste Management Division Waste Status Summary January 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-FEB, 1977, *Production and Waste Management Division Waste Status Summary February 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAR, 1977, *Production and Waste Management Division Waste Status Summary March 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-APR, 1977, *Production and Waste Management Division Waste Status Summary April 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-822-MAY, 1977, *Production and Waste Management Division Waste Status Summary May 1977,* Atlantic Richfield Hanford Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department, Separations Section, January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department, Separations Section, February 1953*,General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, May 31, 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section, Planning and Scheduling, Separations – Operations, June 30, 1953*, General Electric Company, Richland, Washington.

HW-29054, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, July 31, 1953*, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, August 31, 1953*, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, September 30, 1953*, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, October 31, 1953*, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.

HW-31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, February 1954*, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, April 30, 1954*, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington

HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.

HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations – Engineering and Control, July 31, 1954*, General Electric Company, Richland, Washington

HW-33002, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Projects and Personnel Development Subsection, August 31, 1954*, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations, Projects and Personnel Development Subsection, September 31, 1954*, General Electric Company, Richland, Washington.

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Subsection, October 31, 1954*, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, November 30, 1954*, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Su-section, December 31, 1954*, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, January 31, 1955*, General Electric Company, Richland, Washington.

HW-35628, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, February 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, April 30, 1955*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, May 1955*, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, June 30, 1955*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, July 31, 1955*, General Electric Company, Richland, Washington.

HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities through June 1955*, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, August 31, 1955*, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, September 30, 1955*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, October 1955*, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, November 30, 1955*, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, December 31, 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, January 31, 1956*, General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, February 1956*, General Electric Company, Richland, Washington.

HW-42394, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, March 31, 1956*, General Electric Company, Richland, Washington.

HW-42993, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, April 30, 1956*, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, May 31, 1956*, General Electric Company, Richland, Washington.

HW-43895, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, June 30, 1956*, General Electric Company, Richland, Washington.

HW-44860, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, July 31, 1956*,General Electric Company, Richland, Washington.

HW-45140, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Subsection, August 31, 1956*, General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department, Production Operation – Chemical Processing Department, September 30, 1956*, General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, October 1956*, General Electric Company, Richland, Washington.

HW-47052, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling Production Operation, November 30, 1956*, General Electric Company, Richland, Washington.

HW-47640, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, December 31, 1956*, General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, January 31, 1957*, Hanford Atomic Products, Richland, Washington.

HW-48846, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, February 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-49523, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, March 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, April 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-50617, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, May 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51348, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, June 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54067, 1957, *Waste- Status Summary; Chemical Processing Department, November 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54519, 1957, *Waste- Status Summary; Chemical Processing Department, December 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

HW-54916, 1958, *Waste- Status Summary; Chemical Processing Department, January 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55264, 1958, *Waste- Status Summary; Chemical Processing Department, February 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55630, 1958, *Waste- Status Summary; Chemical Processing Department, March 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-55997, 1958, *Waste- Status Summary; Chemical Processing Department, April 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56357, 1958, *Waste- Status Summary; Chemical Processing Department, May 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-56761, 1958, *Waste- Status Summary; Chemical Processing Department, June 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57122, 1958, *Waste- Status Summary; Chemical Processing Department, July 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57550, 1958, *Waste- Status Summary; Chemical Processing Department, August 31, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-57711, 1958, *Waste- Status Summary; Chemical Processing Department, September 30, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58201, 1958, *Waste- Status Summary; Chemical Processing Department, October 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58579, 1958, *Waste- Status Summary; Chemical Processing Department, December 16, 1958*, Hanford Atomic Products Operation, Richland, Washington.

HW-58831, 1959, *Waste- Status Summary; Chemical Processing Department, January 12, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-59204, 1959, *Waste- Status Summary; Chemical Processing Department, February 10, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-59586, 1959, *Waste- Status Summary; Chemical Processing Department, March 10, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60065, 1959, *Waste- Status Summary; Chemical Processing Department, April 16, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60419, 1959, *Waste- Status Summary; Chemical Processing Department, May 18, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-60738, 1959, *Waste- Status Summary; Chemical Processing Department, June 15, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61095, 1959, *Waste- Status Summary; Chemical Processing Department, July 14, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61582, 1959, *Waste- Status Summary; Chemical Processing Department, August 18, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department, September 17, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department, October 19, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department, November 12, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department, December 15, 1959*, Hanford Atomic Products Operation, Richland, Washington.

HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department, January 19, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-63896, 1960, *Chemical Processing Department – Waste Status Summary, February 12, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64373, 1960, *Chemical Processing Department – Waste Status Summary, March 17, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65272, 1960, *Chemical Processing Department – Waste Status Summary, May 18, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-66187, 1960*Chemical Processing Department – Waste Status Summary, July 25, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66557, 1960, *Chemical Processing Department – Waste Status Summary, August 22, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-66827, 1960, *Chemical Processing Department – Waste Status Summary, September 20, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67696, 1960, *Chemical Processing Department – Waste Status Summary, November 29, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-67705, 1960, *Chemical Processing Department – Waste Status Summary, November 30, 1960*, Hanford Atomic Products Operation, Richland, Washington.

HW-68291, 1961, *Chemical Processing Department – Waste Status Summary, January 25, 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-68292, 1961, *Chemical Processing Department – Waste Status Summary, January 30, 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-71610, 1961, *Chemical Processing Department – Waste Status Summary, November 6, 1961*, Hanford Atomic Products Operation, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, February 7, 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, August 8, 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1962*, Hanford Atomic Products Operation, Richland, Washington.

HW-78279, 1963, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, June 1963*, Hanford Atomic Products Operation, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, January 9, 1964*, Hanford Atomic Products Operation, Richland, Washington.

HW-83308, 1964, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July 15, 1964*, Hanford Atomic Products Operation, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1946,*Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.

HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.

HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.

HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.

HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, November 18, 1949, General Electric Company, Richland, Washington.

HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.

HW-1550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.

HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.

HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-23437-DEL, 1952, *Hanford Works Monthly Report for January 1952*, General Electric Company, Richland, Washington.

HW-23698-DEL, 1952, *Hanford Works Monthly Report for February 1952*, General Electric Company, Richland, Washington.

HW-23982-DEL, 1952, *Hanford Works Monthly Report for March 1952*, General Electric Company, Richland, Washington.

HW-33585-DEL, 1954 *Hanford Atomic Products Operation Monthly Report for October 1954*, General Electric Company, Richland, Washington.

ISO-226, 1966, *Chemical Processing Division – Waste Status Summary January 1, 1966 through March 31, 1966*, ISOCHEM INC., Richland, Washington.

ISO-404, 1966, *Chemical Processing Division – Waste Status Summary April 1, 1966 through June 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 through September 30, 1966*, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary*, Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9, January 23, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary, April 5, 1967*, ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary, July 12, 1967*, ISOCHEM INC., Richland, Washington.

RL-SEP-260, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1964 Through December 31, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

CH2M HILL DOCUMENT RELEASE FORM

(1) Document Number: RPP-13873	(2) New Revision Number: 1	☐ New ☐ Page Change ☑ Full Revision ☐ Cancel	
(3) Impacted Documents: none		(4) File Index Number:	
		(5) Effective Date: December 16, 2004	
(6) Document Title: Origin of Wastes in Single-Shell Tanks 241-T-110, 241-T-111 and 241-T-112			
(7) Change/Release Description: see Record of Revision form			
(8) Change Justification: General revision of document to discuss history of waste types transferred into these tanks. Included dission on saltwell pumping of these tanks. Expanded discussion on waste types transferred into tank T-112. Revised tank waste characterization discussion to reflect tank waste information network system information as of October 2004.			

(9) Approvals:

(a) Author (Print/Sign): Michael E. Johnson *Michael E Johnson*	Date: 12/15/2004
(b) Responsible Manager (Print/Sign): Stewart M. Mackay *SMackay*	Date: 12/15/2004
(c) Reviewer (Optional, Print/Sign):	Date:
(d) Reviewer (Optional, Print/Sign):	Date:

(10) Distribution:

(a) Name	(b) MSIN	(a) Name	(b) MSIN
K. D. Boomer	H6-19	B. A. Higley	R2-12
M. J. Jennings	H6-03	J. G. Kristofzski	H6-03
S. M. Mackay	R2-58	D. E. Place	R2-12
A. Tedeschi	H6-19	W. Bryan	H6-19

(11) No. of Pages: ~~78~~ 75 V.F. 12-16-04

Release Stamp

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

(12) HDCS? ☑ Yes ☐ No

(13) Release Type: ☑ Public Release ☐ Internal Release

(14) Release Approval (Print/Sign): J. D. Aardal / *Janis Aardal*

Date: 12-16-2004

A-6003-881 (08/04)

RPP-13873, Rev. 1

ORIGIN OF WASTES IN SINGLE-SHELL TANKS 241-T-110, 241-T-111 and 241-T-112

M. E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 821316 UC:
Cost Center: 501546 Charge Code:
B&R Code: Total Pages: ~~77~~ 75 N.F. 12-16-04

Key Words: Hanford, single-shell tank, 241-T-110, 241-T-111, 241-T-112 Bismuth phosphate process, second plutonium decontamination cycle, 224 building waste, equipment decontamination waste

Abstract: A review of waste transfer documentation was conducted to determine the origin of wastes transferred into single-shell tanks 241-T-110, 241-T-111 and 241-T-112. This review was conducted to support decisions concerning disposition of the waste present in this tank.

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

J. Aardal 12-16-04

Release Approval Date Release Stamp

Approved For Public Release

Tank Farm Contractor (TFC) **RECORD OF REVISION**	(1) Document Number RPP-13873	Page 1

(2) Title

Origin of Wastes in Single-Shell Tanks 241-T-110, 241-T-111 and 241-T-112

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Resp. Engr. (print/sign/date)	Authorized for Release (6) Resp. Mrg. (print/sign/date)
RS1	Add - Title page: Included tank T-112 in title. Document already discussed tank T-112 waste history. Add - Executive Summary: Included summary of tank T-112 waste history and sum of transuranic elements concentrations. Included discussion on origin of equipment decontamination and coating removal waste. Replace - Executive Summary: Replaced discussion on gross alpha concentrations measurements for tanks waste samples with sum of the transuranic elements with half-lives greater than 20-years. Add - Section 2: Expanded discussion on types of records reviewed and information available in each of these records. Add - Sections 2.2.1: Included discussion on prior waste types stored in tanks 241-T-105 and 241-T-106. Add - Section 2.2.3: Discussed variation in sludge volume reported for tank 241-T-110 in historical records. Included discussion on saltwell pumping in 1978 and interim stabilization of tank 241-T-110 in 2000. Add - Section 2.2.4: Indicated that analyses of the equipment decontamination waste solutions were not located during review of available records. Included discussion on saltwell pumping 1976-78 and interim stabilization of tank 241-T-111 in 1995. Add - Section 2.2.5: New section added to expand discussion on cesium ion exchange process waste that was added to tank T-112 in 1973. Included discussion on prior waste types stored in tanks 241-T-105 and 241-T-106 Add - Section 2.2.6: Discussed that WHC-MR-0132 does support waste history described in RPP-13873 for tanks T-111	Michael E Johnson 11/4/04 Michael E. Johnson	SMackay 12/15/04. STEWART MACKAY

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Resp. Engr. (print/sign/date)	(6) Resp. Mrg (print/sign/date)
	and T-112. Add - Section 3.1: Added discussion that plutonium precipitate separated from uranium and fission products was washed three times and the wash water combined with the uranium and fission product solution. Add - Section 3.1: Spent nuclear fuel reprocessing completed in the 221 BiPO4 process when plutonium was separated from the metal waste. Add - Section 3.1: Discussed that after October 20, 1954, the CW from 221-T Plant was transferred as a separate waste stream to underground storage tanks. The 1C waste was treated in 221-T Plant to separate fission products using ferrocyanide precipitation and sent to tanks separate from the CW stream. Change - Table 3: Sr concentrations reported for samples from tanks T-108 (top), T-108 (bottom), C-112 and average for 1C/CW were incorrectly transcribed from the reference document. Error was corrected. Add - Section 3.1.1: Included discussion on off-gas scrubbers and silver chemical reactors that were installed in the 221 BiPO4 Plants. Add - Section 3.3: Included new section discussing processing activities conducted in the 221-B Plant from 1961 through 1985 that generated cesium ion exchange process waste solution, as well as other wastes. Add - Section 4.0: Indicated analyses of core samples and waste templates are the basis for the gross alpha and transuranic elements concentrations reported. Add - Section 5.0: Included summary of tank T-112 waste history and sum of transuranic elements concentrations.		

RPP-13873
Revision 1

ORIGIN OF WASTES IN SINGLE-SHELL TANKS 241-T-110, 241-T-111 AND 241-T-112

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
October 2004

CH2MHILL
Hanford Group, Inc.
Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tanks 241-T-110, 241-T-111 and 241-T-112. This review was conducted to support decisions concerning disposition of the waste present in these tanks.

Tank 241-T-110 received second decontamination cycle (2C) waste from processing plutonium solutions at the 221-T Bismuth Phosphate plant from January 1945 through December 1954, 221-T Plant low activity cell drainage waste from June 1951 through December 1954, and 224-T Concentration building wastes from May 1952 through December 1954. Tanks 241-T-111 and 241-T-112 received 2C waste from the 221-T Plant from January 1945 through October 1956, 221-T Plant low activity cell drainage waste from June 1951 through October 1956, 224-T Concentration building wastes from May 1952 through October 1956, and 221-T Plant equipment decontamination waste from December 1959 through June 1967. Tank 241-T-112 continued to receive 221-T Plant equipment decontamination waste until June 1973. Tank 241-T-112 also received a mixture of coating removal waste 221-B Plant cesium ion exchange process waste from tank 241-T-106 in March 1973.

The second decontamination cycle and 224-T building wastes originated from purification of plutonium solutions. The second decontamination cycle and 224-T building wastes are not waste originating from separating fission products from the uranium fraction of irradiated reactor fuel. Equipment decontamination wastes originated from removing residual radionuclides from failed process equipment to enable this equipment to be repaired and returned to service. Coating removal waste originated from dissolution of the aluminum coating present on irradiated fuel elements, prior to the dissolution of the fuel elements. Cesium ion exchange process waste originated from processing waste solutions at the 221-B Plant to separate cesium from these wastes.

The concentrations of the transuranic elements with half-lives greater than 20-years (i.e. sum of neptunium-237, plutonium-238, plutonium-240, plutonium-240 and americium-241) in the waste stored in tanks 241-T-110, 241-T-111 and 241-T-112 (sludge fraction only) are approximately 83.3ηCi/g, 186.5ηCi/g and 255.2ηCi/g, as reported on October 11, 2004 from the TWINS database.

CONTENTS

1.0 INTRODUCTION 1

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANKS 241-T-110, 241-T-111 AND 241-T-112 1
- 2.1 Description of Tanks 241-T-110, 241-T-111 and 241-T-112 1
- 2.2 Waste Transfers 2
  - 2.2.1 Second Decontamination Cycle (2C) Waste 4
  - 2.2.2 2C Waste Combined with Cell Drainage Waste 5
  - 2.2.3 2C, Cell Drainage, and 224-T Concentration Building Waste 6
  - 2.2.4 Equipment Decontamination Waste 8
  - 2.2.5 Cesium Ion Exchange Process Waste 9
  - 2.2.6 Comparison with Other Reports 10

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 11
- 3.1 B and T Bismuth Phosphate Process Plants 11
  - 3.1.1 221-B and 221-T Cell Drainage Waste 16
- 3.2 224-B and 224-T Concentration Buildings 17
- 3.3 221-B PLANT FISSION PRODUCTS PROCESSING 22
  - 3.3.1 STRONTIUM AND RARE EARTHS PROCESSING 22
  - 3.3.2 CESIUM AND STRONTIUM PROCESSING 24

4.0 TRANSURANIC ANALYSES OF WASTE IN TANKS 241-T-110, 241-T-111 AND 241-T-112 25

5.0 SUMMARY 27

6.0 REFERENCES 28

APPENDIX

A. Volume of Solids and Total Waste in Tanks 241-T-110, 241-T-111, and 241-T-112 .... A-1

FIGURES

Figure 1. Tanks 241-T-110, 241T-111, 241-T-112 Waste Tank Cascade System 3
Figure 2. Bismuth Phosphate Process Diagram 14

TABLES

Table 1. Estimated Composition of Bismuth Phosphate Plant Wastes 15
Table 2. Analyses of Bismuth Phosphate Process Supernatants Stored [1,2] 18
Table 3. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant 19
Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant 20

LIST OF TERMS

1C	first cycle of the decontamination process
2C	second decontamination cycle
CW	Coating waste
DOE	U.S. Department of Energy
lbs	pounds
MW	Metal waste
REDOX	Reduction-Oxidation
ηCi/g	nanocuries per gram
μCi/cc	microcuries per cubic centimeters
μCi/g	microcuries per gram
μg/cc	micrograms per cubic centimeters

1.0 INTRODUCTION

The origin of the wastes in tanks 241-T-110, 241-T-111 and 241-T-112 is important in determining the disposition of these wastes and the waste storage tanks. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tanks 241-T-110, 241-T-111 and 241-T-112. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to these underground storage tanks. Section 4.0 provides a discussion on the transuranic radionuclide analyses of the wastes in these tanks. The concentration of transuranic radionuclides present in these wastes is important to determining the disposition of these wastes. Section 5 summarizes the waste types that were transferred into tanks 241-T-110, 241-T-111 and 241-T-112.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANKS 241-T-110, 241-T-111 AND 241-T-112

This section provides a brief description of tanks 241-T-110, 241-T-111 and 241-T-112 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the wastes presently stored in tanks 241-T-110, 241-T-111 and 241-T-112, publicly available reports for the Hanford Site were reviewed.

Documents reviewed included the Hanford site contractors' monthly reports (1945 through 1975), Army Corp of Engineers monthly reports (December 1944 through December 1946), U. S. Atomic Energy Commission monthly reports (1947 through 1954), waste disposal reports (1948 through 1975), tank farm waste status summary reports, and miscellaneous letters and technical reports.

The Hanford site contractors' monthly reports for January 1945 through July 1951 list the volume of waste stored in the single-shell tanks, with the exception of the B-200 and T-200 series single-shell tanks. No records were located that provided the volume of wastes stored in the single-shell tanks from August 1951 through February 1952. Beginning in March 1952, waste transfers and the volume of waste stored in each single-shell tank were reported for each tank in a waste status summary report.

With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/ or the U.S. Department of Energy (DOE) Information Bridge at http://www.osti.gov/bridge/. The waste status summary reports are available only as photocopies from Hanford Site Records Information Management Services organization.

2.1 DESCRIPTION OF TANKS 241-T-110, 241-T-111 AND 241-T-112

Single-shell tanks 241-T-110, 241-T-111 and 241-T-112 were originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX) and are three of the twelve, 100-series tanks in 241-T Tank Farm. The 100-series tanks are seventy-five-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. Each tank has a design capacity of 530,000 gallons at a liquid depth of sixteen-feet. The overflow pipe for tanks 241-T-110 and 241-T-111 is at an elevation that results in seventeen-feet of waste (~540,530 gallons) being retained in each tank. The overflow pipeline from tank 241-T-112 is at an elevation that results in eighteen-feet of waste (~573,530 gallons) being retained in this tank (HW-27035).

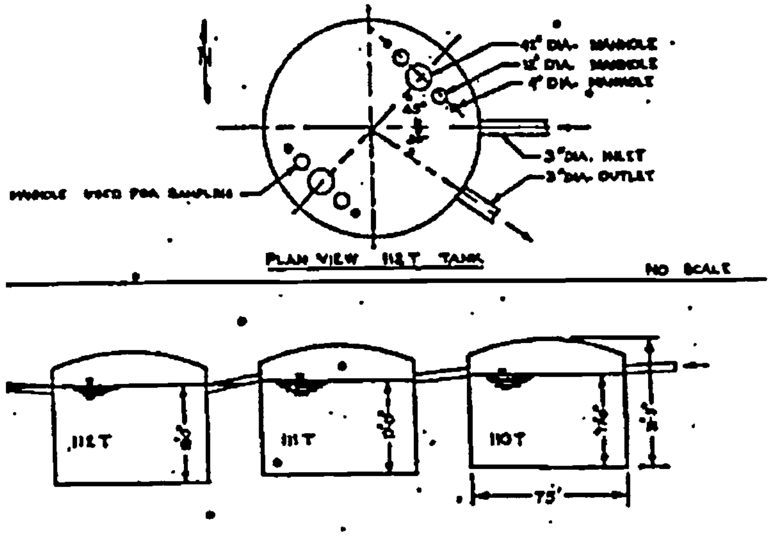
Tanks 241-T-110 and 241-T-111, along with tank 241-T-112, were connected together via underground piping to allow solution to cascade from the lead tank into the subsequent two tanks. Solids settled in each tank, with the supernatant discharged from tank 241-T-112 through an underground pipeline to a crib. In addition to the overflow piping, each tank is equipped with four, 3-inch diameter stainless steel inlet pipes. Originally, only the inlet pipes from tank 241-T-110 were connected to diversion box 241-T-153, with the inlet pipes for the other tanks blanked off close to each tank (HW-10475-C, page 907 –908).

2.2 WASTE TRANSFERS

This section describes waste transfers into and waste removal from tanks 241-T-110, 241-T-111 and 241-T-112. These tanks were operated for a number of years as a three-tank cascade. This section includes a discussion of waste discharge to underground cribs. The design of the tank cascade system is shown in Figure 1 and resulted in tanks 241-T-110 and 241-T-111 being filled with waste that then cascaded into tank 241-T-112. Figure 1 does not represent the current configuration of piping for these tanks. From 1947 through 1951, a jet was used to transfer waste from tank 241-T-112 to the crib. After modifying the disposal system in May 1951, waste was allowed to gravity overflow from tank 241-T-112 to the crib.

The volume and radioactive (plutonium, gross beta, and uranium) content of waste discharged from these tanks to underground cribs is summarized in references HW-17088, HW-20583, HW-25301, HW-28121, HW-33591, HW-38562, HW-44784, HW-72956, ISO-98, and ARH-1608. Appendix A provides a tabular listing of the volume of solids and total waste present in tanks 241-T-110, 241-T-111, and 241-T-112 for January 1945 through December 1975, after which these tanks were no longer used to receive wastes.

Figure 1. Tanks 241-T-110, 241T-111, 241-T-112 Waste Tank Cascade System



2.2.1 Second Decontamination Cycle (2C) Waste

The 241-T Tank Farm was originally constructed to receive waste from the 221-T Bismuth Phosphate plant (see Section 3.0). Tanks 241-T-110, 241-T-111, and 241-T-112 were operated as a cascade. Chemical tracer runs (non-radioactive) were initiated in the 221-T Plant in December 19444, with the second decontamination cycle (designated as 2C) waste from these runs received into tank 241-T-110 (HAN-45800-DEL, page 1). According to the Army Corps of Engineers report for January 1945 (HAN-45800-DEL, page 4), the first radioactive waste was received into tank 241-T-110 from the processing of six charges of material from 100-B reactor in the 221-T Plant to separate plutonium.

Tanks 241-T-110, 241-T-111, and 241-T-112 continued to receive 2C waste through July 22, 1946, at which time these tanks were reported as being filled and 2C waste was diverted to tanks 241-T-105 and 241-T-106 (HAN-45800-DEL, page 64 and HW-7-4542-DEL, page 21). Tanks 241-T-105 and 241-T-106 were originally designated as a spare set of tanks for receipt of 2C waste from the 221-T Plant. In order to allow the collection of 2C waste in tanks 241-T-105 and 241-T-106, a separate transfer pipeline was established to the inlet of tank 241-T-105 on July 17, 1946 (H-2-578 and HAN-45762, pages 27 and 32).

While tanks 241-T-110, 241-T-111, and 241-T-112 remained filled with 2C waste, tanks 241-T-105 and 241-T-106 continued to receive 2C waste from the 221-T Plant. Measurements of the solids depth in tanks 241-T-110, 241-T-111, and 241-T-112 were conducted in October 1946 using an ionization chamber indicated that only tank 241-T-110 contain solids, evenly distributed at a depth of approximately 38 inches, corresponding to ~84,030 gallons (H-7-5362-DEL, page 27).

Plans were initiated in October 1946 to dispose of the 2C supernatant contained in these tanks to an underground crib (HW-7-5362-DEL, page 27). A new underground crib (designated as 241-T-3) was constructed in 1947. Tank 241-T-110 would be used to settle solids that formed in the 2C waste, with the supernatant cascading by gravity flow into tank 241-T-111 and then into tank 241-T-112. The clarified 2C supernatant would be jetted from tank 241-T-112 to the underground crib. Crib disposal of the clarified 2C supernatant was authorized on an experimental basis (HW-10321). The 2C waste contained in tank 241-T-111 was jetted to this underground crib in September 1947 (HW-7795-DEL, page 26).

As part of the planned disposal of the 2C supernatant to the underground crib, separate waste transfer lines were routed to tanks 241-T-111 and 241-T-112 (see drawing H-2-578). This would enable filling these tanks directly with 2C waste when tank 241-T-110 filled with solids and was no longer suitable as a settling tank. Approximately 20,000-gallons of 2C supernatant were jetted from tank 241-T-112 to the underground crib in November 1947 to enable a waste transfer line tie-in from diversion box 241-T-153 to tanks 241-T-111 and 241-T-112 (HW-8267-DEL, page 27). Crib disposal of additional 2C supernatant was delayed until a means to sample the soil in dry wells that surround the crib area was developed.

A tool for sampling the soil in dry wells surrounding the 2C disposal crib area was designed, constructed, and tested in February 1948 (HW-9191-DEL, page 28), but this tool proved unsuccessful in obtaining soil samples when used in March 1948 (HW-9595-DEL, page 30). However, approval was given to resume limited crib disposal of 2C supernatant in April 1948, since tanks 241-T-105 and 241-T-106 were nearly filled with 2C waste and additional storage space in the single-shell tanks was not available. Crib disposal of approximately 360,000 gallons of 2C waste from tank 241-T-105 was conducted in April 1948 (HW-9922-DEL, page 31).

Following extensive sampling of the soil surrounding the 2C waste disposal crib (HW-10166-DEL, page 31), crib disposal of 2C waste contained in tank 241-T-106 was conducted in July 1948 (HW-10714-DEL, page 32) and August 1948 (HW-10993-DEL, page 32). Crib disposal of approximately 450,000 gallons of the 2C waste in tank 241-T-112 was initiated on August 4, 1948 (HW-10993-DEL, page 35) and stopped in September 1948 (HW-11226-DEL, page 32) to allow installation of an experimental sand filter on the jet discharge from tank 241-T-112 to the crib. The experimental sand filter was installed to determine the feasibility of removing additional activity from the 2C supernatant being disposed to the crib. Crib disposal of the remainder of the 2C waste in tank 241-T-112 was completed in October 1948 (HW-11499, page 33).

With the emptying of tank 241-T-112 in August through October 1948, 2C waste was again routed from the 221-T Plant into the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 beginning in August 1948. Tank 241-T-110 was used to settle solids that formed in the 2C waste, with the supernatant cascading by gravity flow into tank 241-T-111 and then into tank 241-T-112. The clarified 2C supernatant was periodically jetted from tank 241-T-112 to the crib (HW-33591, pages 4 and 26) from August 1948 through May 1951. In May 1951, modifications were conducted that allowed the 2C supernatant waste to gravity overflow from tank 241-T-112 into the crib (HW-21260-DEL, page 57).

2.2.2 2C Waste Combined with Cell Drainage Waste

Beginning in June 1951, the neutralized, cell drainage waste from the 221-T Plant (designated as 5-6 waste) was combined with the 2C waste in the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 (HW-21506-DEL, page 56 and H-2-1988). Tank 5-6 in the 221-T Plant was used to collect low activity drainage from the process cells. The generation of cell drainage waste was intermittent and dependent on the frequency of leaks that developed in the 221-T Plant process equipment. High-activity cell drainage waste was collected in tank 5-9 and either reworked or transferred to single-shell tank 241-T-107 (see Section 3.1.1).

The low activity cell drainage was transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 so "... that the major portion of the suspended plutonium carrying solids will settle out while the waste solution combines and cascades concurrently with the second decontamination cycle waste prior to underground cribbing by constant overflow" (HW-21506-DEL, page 56). The combined 2C waste and cell drainage waste from tank 5-6 were transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112. All three tanks were essentially filled with waste to the overflow pipeline. Solids gravity settled and supernatant gravity overflow from tank 241-T-112 into the crib.

2.2.3 2C, Cell Drainage, and 224-T Concentration Building Waste

Beginning on May 29, 1952, the waste from the 224-T Concentration building (designated as 224 waste) was discharged to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 along with the cell drainage waste collected in tank 5-6 and the 2C waste from the 221-T Plant (HW-27838, page 17). Section 3.1 provides a description of the plutonium concentration process conducted in the 224-T Concentration building. These three waste streams (2C / 224 / 5-6) continued to be collected in the cascade of tanks 241-T-110, 241-T-111, and 241-T-112. All three tanks were essentially filled with waste to the overflow pipeline. Solids gravity settled and supernatant gravity overflow from tank 241-T-112 into the crib.

In December 1954, tank 241-T-110 was reported as filled with sludge (530,000 gallons) and only tanks 241-T-111 and 241-T-112 were receiving the 2C / 224 / 5-6 waste streams (HW-34412, page 6 and H-2-2398). A review of Hanford Site monthly reports and waste status summary reports from 1955 to the present indicate that no additional waste was transferred into tank 241-T-110. This review also observed that the documented, volume of solids contained in this tank was recorded generally as 530,000 gallons through July 1957and then reported as 46,000 gallons from August 1957 through June 1966. The tank 241-T-110 sludge volume was reported typically as 508,000 gallons from July 1966 through September 1969, then 293,000 gallons through September 1974, and 466,000 gallons from October 1974 through March 1982. Following completion of salt well pumping in 1978 (RMIS TFIC # D196235596), the tank 241-T-110 sludge level was reported at 370,000 gallons in April 1982 to the present. Supernatant and interstitial liquids were removed from tank 241-T-110 in 2000 as part of interim stabilization of the single-shell tanks (HNF-SD-RE-TI-178, pages 218-222).

The reason for the variations in the measured solids volume in tank 241-T-110 was not reported in the waste status summary reports, but could be due to inaccurate measurements. Sludge depth measurements were obtained by lowering a weight through a riser in the single-shell tank and attempting to determine the sludge interface with the supernatant. The distance from the riser bench-mark to the sludge interface was determined and the sludge depth was then calculated. The date when sludge measurements were actually obtained was not located in the available documentation. An erroneous measurement or calculation may have been recorded in August 1957 and the sludge depth not measured again until July 1967. Sludge removal from tank 241-T-110 has not been conducted as of June 2004 and is not the source for the variation in measured sludge volume.

Tanks 241-T-111 and 241-T-112 continued receiving the 2C / 224 / 5-6 waste streams and by March 1955, were reported as containing approximately 487,000-gallons and 33,000 gallons of sludge, respectively (HW-36001, page 6). This prompted the transfer in April 1955 of 115,000 to 133,000-gallons of sludge from tank 241-T-111 to tank 241-T-112 (HW-36553, page 6). Tank 241-T-111 was reported as containing approximately 362,000 gallons of solids after this transfer. Tank 241-T-112 was reported as having 33,000 gallons of solids before this transfer (HW-36001, page 6) and approximately 170,000 gallons of solids after this transfer (HW-37143, page 6). The solids were transferred from tank 241-T-111 into tank 241-T-112 to provide sufficient space in tank 241-T-111 for gravity settling of solids present in the 2C / 224 / 5-6 wastes before the clarified supernatant was overflowed to tank 241-T-112 and to the 241-T-3 crib (after 1958 referred to as the 216-T-7 crib).

The 241-T-3 crib continued to receive the supernatant overflowed from tank 241-T-112 until November 30, 1955, after which the 241-TX-153 crib (after 1958 referred to as the 216-T-19 crib) was used (HW-44784, pages 43 and 44). Additionally, approximately 700,000 gallons of waste was discharged from tank 241-T-112 to the 241-T trench number 5 on May 5, 1955, to empty this tank (HW-38562, page 28). Trench 241-T number 5 is also referred to as trench number 216-T-5 (HW-48518, page 42).

The 2C / 224 / 5-6 wastes continued to be transferred into the cascade of tanks 241-T-111 and 241-T-112 through March 20, 1956, when the final processing of irradiated fuels for plutonium recovery was completed in the 221-T Plant (HW-42219-DEL, page ED-5). Process equipment flushes using nitric acid and peroxide – caustic were conducted in the 221-T Plant from March 1956 (HW-42219-DEL, page ED-5) through September 1956 (HW-45707-DEL, page D-5) to recover plutonium and remove fission products from the equipment. The acid flushes were processed through the normal flowsheet, generating additional 2C and 224 wastes that were transferred to the cascade of tanks 241-T-111 and 241-T-112. The 221-T Plant was placed in standby status whereas the 224-T building was placed in lay-away status in October 1956 (HW-46432-DEL, page D-5). The volume of solids and liquid report in tanks 241-T-111 were 510,000 gallons and 20,000 gallons as of September 30, 1956 (HW-45738, page 6). The volume of solids and liquid report in tanks 241-T-112 were 170,000 gallons and 259,000 gallons as of September 30, 1956 (HW-45738, page 6).

Water transfers through the equipment in the 221-T Plant were conducted once per week beginning in October 1956 following chemical flushing to keep the gaskets installed in piping wetted (HW-46432-DEL, page D-5). If the gaskets dried out, leaks could develop if the equipment were restarted. Water transfers through the 221-T Plant equipment were continued through January 1957 (HW-48132-DEL, page D-6) and were terminated when the 221-T Plant was transitioned to final lay-away status in June 1957 (HW-51211-DEL, page D-6).

The disposition of the water transferred through process equipment in the 221-T Plant is not specified in the Hanford Site monthly reports or waste status summary reports. Reports that document radioactive liquid discharges to the ground for 1956 through 1959 do not indicate the discharge of any waste from tank 241-T-112 to the crib (number 241-TX-153 also known as the 216-T-19 crib) after August 1956 (HW-48518, page 35, HW-59359, page 7, and HW-63646, page 7). Tank 241-T-111 was filled to the overflow pipeline and the total waste volume in tank 241-T-112 fluctuated from 429,000 gallons (HW-45738, page 6) to 417,000 gallons (HW-50127, page 6) during this period, without any cause noted for the volume changes. Therefore, it cannot be determine with certainty whether the water used to wet equipment in 221-T Plant was discharged to tank 241-T-111 and 241-T-112.

2.2.4 Equipment Decontamination Waste

The 221-U Plant was being used to decontaminate equipment from the Reduction-Oxidation (REDOX) plant, which processed spent nuclear fuels to recover uranium and plutonium. In October 1958, plans were developed to convert the 221-T Plant for use as decontamination facility for equipment from the REDOX plant (HW-58051-DEL, page D-5) and use the 221-U Plant for another purpose. Work was conducted from February 1959 (HW-59434-DEL, page D-4) through June 1960 (HW-65935-DEL, page C-2) to convert the 221-T Plant to an equipment decontamination facility. Equipment decontamination activities were initiated at the 221-T Plant in July 1960, with the receipt of a failed multipurpose dissolver from the REDOX plant (HW-66271-DEL, page C-2).

The Hanford Site monthly reports and waste status summary reports indicate that no waste was transferred into or out of tanks 241-T-110, 241-T-111 and 241-T-112 from August 1956 through November 1959 during modifications to the 221-T Plant. In December 1959, 2,750 gallons of waste were transferred from 221-T Plant into tank 241-T-111 (HW-83906-C-RD, page 92), presumably resulting from the equipment modifications conducted at 221-T Plant. The composition or specific source of the equipment modification waste was not found during review of available documentation. However, all 221-T Plant equipment had been flushed using nitric acid and peroxide – caustic solution during 1956 to recover plutonium and remove fission products (see section 2.2.3). Therefore, the waste transferred from 221-T Plant to tanks 241-T-111 and 241-T-112 would have contained only residual levels of fission products.

As part of readying 221-T Plant for this new mission, a route was established in November 1959 from the 221-T Plant to crib number 241-TY (later referred to as 216-TY-3 or 216-T-28) for disposal of low activity waste (HW-62864, page D-4). Low activity waste was transferred from 221-T Plant into the cascade of tanks 241-T-111 and 241-T-112 and then pumped from tank 241-T-112 to the underground crib. The waste status summary reports for the underground storage tanks at the Hanford Site indicate tank 241-T-112 received 3,000 gallons of waste from 221-T Plant in March 1960 (HW-64810, page 6 and HW-83906-C-RD, page 119) and 16,000 gallons in May 1960, with 44,000 gallons of waste pumped to the 241-TY-3 crib (HW-65643, page 6 and HW-83906-D-RD, page 131). Additional decontamination waste continued to be received periodically into the cascade of tanks 241-T-111 and 241-T-112 and was pumped to the underground crib (216-T-28; then 216-T-36 after May 1967) through June 1967 (HW-83906-D-RD, HW-83906-E-RD, ISO-538, and ISO-674).

After July 1967, equipment decontamination waste from 221-T Plant was transferred directly into tank 241-T-112, with the supernatant discharged to crib number 216-T-36 (ARH-95). Tank 241-T-111 no longer was used to receive waste. Supernatant and interstitial liquids were removed from tank 241-T-111 between 1976 and 1978 (RMIS TFIC #D196235379) and 1995 as part of isolation and interim stabilization of the single-shell tanks (HNF-SD-RE-TI-178, pages 223-225).

From July 1967 through June 1972, equipment decontamination waste was transferred from 221-T Plant into directly into tank 241-T-112. Waste was transferred from tank 241-T-112 to the

REDOX plant for evaporation, with the concentrated waste transferred to other single-shell tanks (ARH-1200 C, ARH-1200 D, ARH-1666 A, B, C, D, ARH-2074 A, B, C, D, and ARH--2456 A, B). From July 1972 through June 1973, equipment decontamination waste was transferred from 221-T Plant into tank 241-T-112, and then to single-shell tank 241-U-107 (ARH-2456 C, D, and ARH-2794 A, B). After June 1973, tank 241-T-112 was no longer used to receive 221-T Plant decontamination waste. The equipment decontamination waste was transferred from 221-T Plant into tank 241-U-107 beginning in October 1973 (ARH-2794 D).

2.2.5 Cesium Ion Exchange Process Waste

Tank 241-T-112 received 350,000 gallons of a mixture of coating removal waste, B-Plant cesium ion exchange waste, and laboratory waste from tank 241-T-106 and 20,000 gallons of waste from diversion box catch tank 241-T-301 in January through March 1973 (ARH-2794A). No other waste was transferred into tank 241-T-112 after March 1973. Supernatant and interstitial liquids were removed from tank 241-T-112 in 1974, 1976 and 1981 as part of isolation and interim stabilization of the single-shell tanks (HNF-SD-RE-TI-178, page 6).

Prior to 1973, tank 241-T-106 was used to stored 2C waste, first decontamination cycle (1C) and coating removal waste (CW) from the 221-T Plant and coating removal waste from the REDOX Plant. As discussed in section 2.2.1, tanks 241-T-105 and 241-T-106 were spare single-shell tanks that were placed in service to receive and stored 2C waste from the 221-T Plant beginning in July 1946. The 2C waste was received into tank 241-T-105 from July 23, 1946 (HW-7-4542-DEL, page 22) through April 1948, after which the 2C supernatant waste was discharged to a crib (HW-9922-DEL, page 31). Tank 241-T-106 began to receive 2C waste through the overflow line from tank 241-T-105 in June 1947 (HW-7-7454-DEL, page 26) and was filled in March 1948 (HW-9595-DEL, page 32). The 2C supernatant waste contained in tank 241-T-106 was discharged to a crib from July 1948 (HW-10714-DEL, page 32) through August 3, 1948 (HW-10993-DEL, page 35).

After emptying the 2C supernatant waste from tanks 241-T-105 and 241-T-106, the combined 1C/CW waste was transferred from 221-T Plant to tank 241-T-105 beginning in May 1948 (HAN-45807-DEL, page 55). Waste began to cascade from tank 241-T-105 into tank 241-T-106 in August 1948. Tank 241-T-105 continued to receive 1C/CW waste and cascade waste into tank 241-T-106 through January 1949, at which tanks 241-T-105 and 241-T-106 were filled with 1C/CW waste (HW-12391-DEL, page 38). The 1C/CW supernatant contained in tank 241-T-106 (along with other tanks in 241-T farm) was processed through the 242-T Evaporator from in 1951 with the concentrated 1C/CW supernatant waste (i.e., evaporator bottoms) stored in tanks 241-TX-116 and 241-TX-117. The evaporator bottoms in tanks 241-TX-116 and 241-TX-117 were eventually processed again through the 242-T Evaporator to further concentrate these wastes for storage in tanks 241-TX-110 and 241-TX-111 (RPP-16129, section 2.2.2). Tank 241-T-106 again was used as part of the cascade of tanks 241-T-104 and 241-T-105 to store 1C/CW waste from the 221-T Plant from August 1951 through September 1954, with some of the 1C/CW supernatant discharged from these tanks to a trench in early 1954 (RPP-16129, sections 2.2.3 and 2.2.4). All of the 1C/CW supernatant was transferred from tank 241-T-106 to 241-TX-

118 in January 1955 for processing in the 242-T Evaporator, leaving approximately 10,000 gallons of 2C and 1C/CW sludge in this tank (HW-35022, page 5).

Tank 241-T-106 then received ~221,000 gallons of REDOX Plant coating removal waste supernatant in May 1956 from tank 241-U-110 (HW-43490, page 5). Tank 241-T-106 next received 221,000 gallons of REDOX Plant coating removal waste supernatant from tank 241-S-107 via the cascade overflow line from tank 241-T-105 in June 1965 (HW-83906-E-RD, page 62c) and an additional 90,000 gallons of this same waste type in 1966 (ISO-226, page 5). The REDOX Plant coating removal waste was transferred from tank 241-T-106 to tank 241-TY-101 in the third quarter of 1969, leaving approximately 26,000 gallons of sludge and 42,000 gallons of supernatant in this tank (ARH-1200 C, page 7).

In January through March 1973, tank 241-T-106 received a mixture of supernatant wastes (~455,000 gallons) from tank 241-T-105 consisting of B-Plant cesium ion exchange waste and laboratory waste (ARH-2794A). Approximately 350,000 gallons of supernatant were then transferred from tank 241-T-106 to tank 241-T-112 in June 1973.

2.2.6 Comparison with Other Reports

Waste transfers into and waste removals from tanks 241-T-110, 241-T-111 and 241-T-112 were summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132), *Waste Status and Transaction Record Summary for the Northwest Quadrant of the Hanford 200W Area* (WHC-SD-WM-TI-669, Rev. 1), *Historical Tank Waste Content Estimate for the Northwest Quadrant of the Hanford 200 West Area* (HNF-SD-WM-ER-351, Rev. 1), and *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311). In general, the information cited in Sections 2.2.1 through 2.2.4 is in agreement with these previous reports.

These previous reports accurately state the volume of waste transferred into and removed from tanks 241-T-110, 241-T-111 and 241-T-112, as well as the volume of solids and total waste stored in each tank. Specifically, these previous reports do indicate the waste transferred to this tank cascade from was 2C waste from January 1945 through May 1951, combined 2C / 5-6 waste from June 1951 (WHC-MR-0132, page 4) through 1st quarter 1952 and 2C / 224 / 5-6 waste from 2nd quarter 1952 through 1st quarter 1957. These previous reports do indicate that the source of waste transferred into tank 241-T-111 from December 1959 (4th quarter 1959) through June 1967 was from 221-T Plant, but do not describe these wastes as originating from equipment decontamination conducted in the 221-T Plant (see Section 2.2.4). These previous reports also accurately reflect the waste transfer history associated with tank 241-T-112, as described in this report.

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous spent nuclear fuel reprocessing, research and development, plutonium processing and waste management activities conducted at the Hanford Site starting in 1944. These spent nuclear fuel reprocessing, research and development, plutonium processing and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997.*

It has been established in Section 2.0 that second decontamination cycle (2C) wastes and tank 5-6 cell drainage wastes from the 221-T Bismuth Phosphate plant and 224-T building wastes were transferred into tanks 241-T-110, 241-T-111, and 241-T-112. Additionally, tanks 241-T-111 and 241-T-112 received equipment decontamination waste and tank 241-T-112 received coating removal waste and 221-B Plant cesium ion exchange process waste. The following sections provide a discussion of the wastes originating from operation of the 221-T Bismuth Phosphate plant, 224-T Concentration building and 221-B Plant cesium ion exchange process waste. Equipment decontamination waste from the 221-T Plant was previously discussed in Section 2.2.4.

3.1 B AND T BISMUTH PHOSPHATE PROCESS PLANTS

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from spent nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion.

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste, sometimes referred to as coating waste (CW), was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

Reprocessing of the spent nuclear fuel commenced with the dissolution of the uranium fuel elements. The uranium fuel elements (see item [2] in Figure 2) were then dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented uranium precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed three times with water to separate the acidic supernatant from the plutonium precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW). Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). The laboratory tests indicate the percentage of cecium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively.

After separating and washing the plutonium precipitate from the metal waste, reprocessing of spent nuclear fuel was completed in the 221 Plant Bismuth Phosphate process. Plutonium decontamination was conducted in the remainder of the 221 Plant Bismuth Phosphate process. The plutonium bearing cake was dissolved in nitric acid and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products ("by-product precipitation"), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C) were transferred to single-shell tanks. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16). During operation of 221-B Plant, the 1C waste was combined with the coating removal waste and transferred to the same single-shell tank. This same practice was conducted in 221-T Plant from December 1944 through October 19, 1954. Beginning on October 20, 1954, nickel ferrocyanide scavenging of the 1C waste was conducted in T-Plant (but not in B-Plant) to precipitate cesium-137 and strontium-90 (HW-33585-DEL, page Ed-8, and HW-33184). The precipitated 1C waste slurry was transferred separate from the coating removal waste to different single-shell tanks for settling of the precipitate and discharge of the scavenged (i.e., cesium and strontium depleted) supernatant to a crib.

The plutonium solids were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28). The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

Table 1 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C, and 2C that was stored in single-shell tanks are provided in Tables 2 and 3. The CW was combined with the 1C waste in the same tanks in the Bismuth Phosphate process. Note that the coating waste batch size shown in Table 1 is based on 6,600-lbs uranium, but that the metal waste dissolution batch size is based on 2,200-lbs uranium. These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Figure 2. Bismuth Phosphate Process Diagram

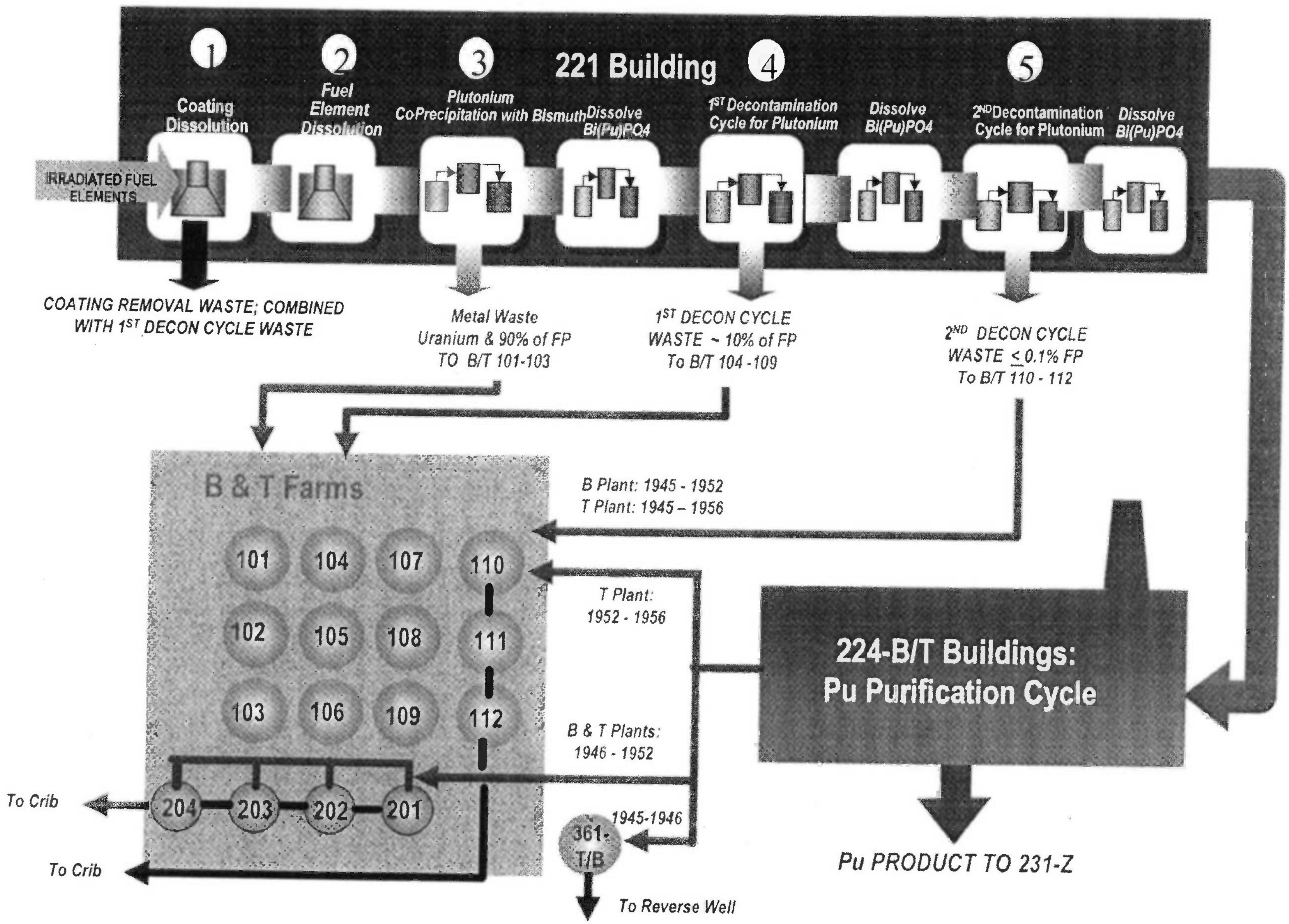


Table 1. Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet [1]

Analyte [2]	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04 [6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02 [6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

[1] See HW-23043

[2] Analyses are reported in grams per liter, except for gamma activity, which is counts/minute/mL.

[3] HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.

[4] Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).

[5] Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).

[6] Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

Note that the coating waste batch size shown in Table 1 is based on 6,600-lbs uranium, but that the metal waste dissolution batch size is based on 2,200-lbs uranium. These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products.

3.1.1 221-B and 221-T Cell Drainage Waste

During the operation of the 221-B and 221-T Bismuth Phosphate plants, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B and 221-T Plants contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High activity waste collected in 221-T Plant and 221-B Plant tanks 5-9 could be jetted to single-shell tank 241-T-107 and 241-B-107, respectively (HW-10475-C, page 918). Alternatively, the waste could be transferred to process vessels with the 221-T (or 221-B) Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-Del, page 28).

The T-Plant stack drainage waste was also collected as part of the cell drainage until May 28, 1951, after which the stack drainage was routed to the cascade of single-shell tank 241-TX-113, 241-TX-114, and 241-TX-115 (HW-21260-DEL, page 58). Also, the dissolvers located in 221-B and 221-T Plant cells 5, 6 and 7 were equipped with off-gas scrubber towers in May 1948 (HAN-45807, pages 57). The dissolver off-gas scrubbers used water to adsorb iodine and remove particulates from the dissolver off-gases. The spent scrubber solution was combined with the low-activity cell drainage waste collected in tank 5-6 (HW-10728). The dissolver off-gas scrubbers were replaced with silver chemical reactors, thus eliminating the spent scrubber solution. The first silver reactor was installed in the 221-B Plant in October 24, 1950 (HW-19898 and HW-19325, page 52) and the remaining silver chemical reactors were installed in the 221-B and 221-T Plants by January 1951 (HW-20161, page 52 and HW-21826).

Waste collected in tank 5-6 was transferred to reverse well number 216-T-3 from January 1945 through August 1946. Crib number 216-T-6 was used to dispose of the cell drainage waste from August 1946 through June 1951. After June 1951, cell drainage waste was transferred to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 (HW-55176, part V). The quantity and composition of the cell drainage solutions discharged from tank 5-6 varied (see HW-20583, page 4 and HW-33591, page 25). Table 4 provides analyses of cell drainage waste that was collected in tank 5-6 and transferred to either crib 216-T-6 or to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112. As evident from the analyses provided in Table 4, the neutralized, low activity cell drainage waste contained soluble beta emitting radionuclides and plutonium.

3.2 224-B AND 224-T CONCENTRATION BUILDINGS

The process steps executed in the 224 buildings were as follows:

- The starting batch size received from the 221 buildings was 330 gallons.
- Plutonium solution from the 221 buildings was oxidized with sodium bismuthate to convert the plutonium to the +6 valence state.
- Phosphoric acid was added to produce a bismuth phosphate ($BiPO_4$) precipitate, with the plutonium still in solution. At this point, operators wanted to get rid of all the $BiPO_4$.
- The solution and precipitate were separated by centrifugation.
- Nitric acid was added to dissolve the $BiPO_4$ precipitate, with this solution removed as waste.
- Potassium permanganate ($KMnO_4$) was added to the plutonium solution to ensure all the plutonium was in the +6 valence state.
- Hydrogen fluoride and lanthanum salts were added to the plutonium solution producing a lanthanum fluoride precipitate. Fission products were carried with the lanthanum. This precipitate contained all the lanthanides (cerium, lanthanum, etc.) and residual ruthenium, samarium, europium, americium, and curium that the $BiPO_4$ could not carry out of the stream.
- The lanthanum fluoride precipitate was dissolved in nitric acid, neutralized with sodium hydroxide, and sent to waste storage tanks.
- Oxalic acid was added to the plutonium solution collected from the lanthanum fluoride precipitation step to reduce the plutonium to the +4 valence-state.
- Hydrogen fluoride and lanthanum salts were added to the plutonium solution producing a lanthanum fluoride and plutonium fluoride precipitate. The precipitate was centrifuged to collect the solids.
- Potassium hydroxide was added to convert the plutonium fluoride / lanthanum fluoride precipitate into lanthanum hydroxide and plutonium hydroxide solids.
- After centrifuging to separate the lanthanum hydroxide and plutonium hydroxide solids, these solids are reacted with nitric acid solution to dissolve the lanthanum and plutonium. The plutonium nitrate / lanthanum nitrate solution product was now ready for transfer to the 231-Z building or 234-5 building.

By this time, each original 330-gallon batch of plutonium-bearing solution that had entered the 224 Buildings was concentrated down to eight gallons. The liquid waste (designated as 224) from the lanthanum fluoride precipitation process was neutralized and transferred to the single-shell underground storage tanks. The resulting purified plutonium material was transferred to the 231-Z building and subsequently to the 234-5 building (Z Plant) beginning in 1949 for further processing.

Table 2. Analyses of Bismuth Phosphate Process Supernatants Stored (1,2)

Waste Type	Tank	pH	Pu µg/liter	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200(5)	70(5)	12-12-1946
Metal Waste	T-101	10	35	110(5)	25(5)	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? (3)	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µg/liter**	**Gross Beta Counts / minute/ cc**	**Gross Gamma Counts / minute/ cc**	**Date Sampled**
2C	T-110	Not reported (4)	15	4.9E+04	30	7-13-1945
2C	T-110	9.8(4)	19	6.9E+04	55	7-25-1945
2C	B-110	9.6(4)	8.5	7.0E+04	55	7-25-1945

Notes:

(1) See HW-10728 and HW-3-3220.

(2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

(3) The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.

(4) Prior to October 1945, the 2C waste was neutralized to a pH of approximately 10. The waste collected in tanks 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

(5) Decreases in gross beta and gross gamma concentrations shown for the T-101 waste samples are due to decay of fission products with short half-lives.

Table 3. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant

Tank	Date Filled	Pu µg/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y – Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.012	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.012	Not reported	0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.006	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.0058**	**0.15**						

Notes:

[1] HW-36717, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, May 16, 1955, W. W. Schulz, General Electric Company, Richland, Washington.

[2] HW-20195, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, February 5, 1951, General Electric Company, Richland, Washington.

[3] Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
Tank 5-6 Cell Drainage Transferred to 216-T-6 Crib [1,2]					
1948	January	839,900	49	88	Total beta activity does not include radioactive iodine. Samples were measured for total alpha activity. Calculated Pu mass assumes that all alpha activity measured in samples was Pu. Uranium activity in samples contributed less than 8% of the total alpha activity [1].
	February	724,461	8	73	
	March	586,188	3	789	
	April	842,778	9	461	
	May	918,007	5	72	
	June	971,810	9	295	
	July	1,057,015	6	130	
	August	831,662	4	248	
	September	857,327	5	361	
	October	830,083	4	116	
	November	980,411	6	214	
No records could be located for December 1948 through August 1949.					
1949	September	260,000	32	365	
	October	360,000	41	2800	
	November	340,000	38.2	333	
	December	430,000	48	250	
1950	January	410,000	44	210	
	February	330,000	28.5	No data reported	
	March	370,000	35	No data reported	
	April	450,000	35.6	294	
	May	370,000	33.9	363	
	June	430,000	36.6	2142	
	July	520,000	43.6	600	
	August	590,000	44.9	741	
	September	480,000	42.3	850	
	October	620,000	47.3	858	
	November	540,000	50.9	600	
	December	590,000	42.1	850	
No records could be located for January 1951 through December 1951. Beginning in June 1951, Tank 5-6 cell drainage waste along with 2C waste was routed to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112.					

Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
Tank 5-6 Cell Drainage Waste Discharged to the Cascade of Tanks 241-T-110, 241-T-111, and 241-T-112 [3,4]					
1952	January	595,000	5.2	440	
	February	498,000	6.9	850	
	March	643,000	8.2	920	
	April	623,000	8.8	660	
	May	318,000	1.8	84	
	June	392,000	3.0	97	
	July	600,000	4.1	160	Beginning in July 1952, 224 building waste, along with tank 5-6 cell drainage and 2C wastes were routed to the cascade of tanks 241-T-110, 241-T-111, and 241-T-112. Values reported are for tank 5-6 cell drainage waste only.
	August	670,000	6.5	265	
	September	260,000	1.9	675	
	October	430,000	3.0	310	
	November	490,000	2.7	95	
	December	540,000	3.3	240	
1953	January	490,000	2.4	130	
	February	530,000	3.9	480	
	March	660,000	5.0	245	
	April	390,000	2.0	180	
	May	490,000	1.8	220	
	June	660,000	3.5	590	
	July	280,000	0.9	65	
	August	490,000	2.4	100	
	September	560,000	7.8	195	
	October	560,000	6.8	1,840	
	November	710,000	8.7	1,085	
	December	740,000	8.8	885	
1954	January	830,000	10.4	1,680	
	February	820,000	14.2	16,420	
	March	860,000	18.6	5,305	
	April	540,000	8.4	2,175	
	May	790,000	10.6	1,760	
	June	810,000	9.5	2,390	
	July	1,030,000			Radionuclide content not reported separately for 5-6 Cell drainage waste from July 1954 thru June 1955 (HW-38562, page 26).
	August	1,150,000			
	September	1,090,000			
	October	800,000			
	November	730,000			
	December	1,100,000			
1955	January	1,370,000			
	February	950,000			
	March	1,460,000			
	April	1,380,000			

Table 4. Composition of Tank 5-6 Cell Drainage Waste from 221-T Plant

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
	May	1,410,000			
	June	1,440,000			
The volume and radionuclide content of tank 5-6 cell drainage waste were not recorded separate from other wastes transferred into the cascade of tanks 241-T-110, 241-T-111, and 241-T-112 after July 1954.					

Notes:

(1) HW-11908
(2) HW-20583
(3) HW-25301
(4) HW-33591
(5) Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50% ruthenium, 35 to 50% cesium, 4 to 8% cerium, yttrium, and other rare earths, and 6 to 11% undetermined (HW-27035, page 8).

3.3 221-B PLANT FISSION PRODUCTS PROCESSING

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

3.3.1 STRONTIUM AND RARE EARTHS PROCESSING

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, pages B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144 and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, and cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.3.2 CESIUM AND STRONTIUM PROCESSING

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917). After separation of cesium, the alkaline supernatants were transferred directly to underground storage tanks. The ion exchange process used an ammonium carbonate / ammonium hydroxide solution to separate sodium from cesium on the ion exchange media. The aqueous wastes that contained ammonium were processed in the Cell 23 evaporator to concentrate these wastes and volatilize ammonia before transferred to underground storage tanks.

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PR-REPORT-SEP68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges. The PUREX high-level waste sludges were dissolved in nitric acid (known as PAS) in the 244-AR Vault and transferred to B-Plant for centrifugation to separate solids. The clarified solution was process in the solvent extraction equipment to separate strontium (PR-REPORT-SEP-68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until 1977. The aqueous waste from the solvent extraction process was evaporated in the Cell 23 evaporator and transferred to underground storage tanks.

4.0 TRANSURANIC ANALYSES OF WASTE IN TANKS 241-T-110, 241-T-111 AND 241-T-112

The Hanford Site prepares a Best Basis Inventory (BBI) estimate of the composition of the wastes stored in all 177 Hanford Site underground storage tanks. The BBI effort involves developing and maintaining waste tank inventories comprising 25 chemical and 46 radionuclide components in the 177 Hanford Site underground storage tanks. Waste sample analyses, process knowledge, and waste templates are used to create the BBIs. These BBIs provide waste composition data necessary as part of the River Protection Project (RPP) process flowsheet modeling work, safety analyses, risk assessments, and system design for retrieval, treatment, and disposal operations. Development and maintenance of the BBI is an on-going effort, with the current BBIs available electronically through TWINS, http://twins.pnl.gov/data/datamenu.htm.

The BBI for the tank 241-T-110 waste is based on the analyses of two core samples obtained in 1996. Composites of these core samples were analyzed for non-radioactive components and total alpha concentrations. A re-analysis of a composite sample was conducted in 2003 to determine the concentrations cesium-137, strontium-90 and individual transuranic elements with half-life greater than 20-years (i.e. neptunium-237, plutonium-238, plutonium-239, plutonium-240 and americium-241). The analytical results were reviewed and used along with engineering judgment to determine the best basis inventory for the waste stored in tank 241-T-110. The mean, total alpha analysis for the waste stored in tank 241-T-110 is 53ηCi/g. The uncertainty estimates for the total alpha analyses for the waste stored in tank 241-T-110 were evaluated (RPP-10983). The upper 95% confidence limit for the gross alpha analyses of the waste stored in tank 241-T-110 is 62ηCi/g. The sum of the neptunium-237, plutonium-238, plutonium-239, plutonium-240 and americium-241 concentrations analyzed in the composite core sample is approximately 83.3ηCi/g, as reported on October 11, 2004 from the Tank Waste Information Network (TWINS) database; http://twins.pnl.gov/. These analyses indicate that the concentration of alpha-emitting transuranic isotopes with half-life greater than 20 years is less than 100ηCi/g in the waste stored in tank 241-T-110.

The BBI for the tank 241-T-111 waste is based on two core samples obtained in 1991. Composite of these core samples were analyzed for non-radioactive components, select radionuclides, total alpha and transuranic element concentrations. The analytical results were reviewed and used along with engineering judgment to determine the best basis inventory for the waste stored in tank 241-T-111. The mean total alpha analyses and lower 95% confidence limit for the waste stored in tank 241-T-111 are 371ηCi/g and 289ηCi/g (7G300-02-JGF-009). The total alpha analyses of the waste in tank 241-T-111 are support by analyses of this waste for neptunium-237, plutonium-238, plutonium-240, plutonium-240 and americium-241. The sum of these transuranic elements is approximately 186.5ηCi/g in the waste stored in tank 241-T-111, as reported on October 11, 2004 from the Tank Waste Information Network (TWINS) database; http://twins.pnl.gov/.

The BBI for the tank 241-T-112 waste is based on two core samples obtained in 1997. These two core samples were analyzed to determine gross alpha and non-radioactive constituents in the liquid and solids portions of these samples. Template values were used for constituents below the detection limits for sample data or constituents not measured from the sampling event. Templates are based on sampling data from tanks that contain the same waste type as tank 241-T-112, supplemented with Revision 5 of the HDW model data (RPP-19822). The mean, total alpha analysis for the sludge fraction of the waste stored in tank 241-T-112 is 255ηCi/g. The template based sum of neptunium-237, plutonium-238, plutonium-240, plutonium-240 and americium-241 concentrations in the sludge fraction of the waste stored in tank 241-T-112 is approximately 255.2ηCi/g.

5.0 SUMMARY

Tanks 241-T-110 received 2C waste from reprocessing of spent nuclear fuel at the 221-T Plant from January 1945 through December 1954, low-activity cell drainage waste from June 1951 through December 1954, and 224 wastes from May 1952 through December 1954. Tank 241-T-111 received 2C waste from the 221-T Plant from January 1945 through October 1956, low-activity cell drainage waste from June 1951 through October 1956, 224 wastes from May 1952 through October 1956, and equipment decontamination waste from December 1959 through June 1967. Tank 241-T-112 continued to receive 221-T Plant equipment decontamination waste until June 1973. Tank 241-T-112 also received a mixture of coating removal waste 221-B Plant cesium ion exchange process waste from tank 241-T-106 in March 1973.

The concentrations of the transuranic elements (i.e. sum of neptunium-237, plutonium-238, plutonium-240, plutonium-240 and americium-241) in the waste stored in tanks 241-T-110, 241-T-111 and 241-T-112 (sludge only) are approximately 83.3ηCi/g, 186.5ηCi/g and 255.2ηCi/g, as reported on October 11, 2004 from the TWINS database.

6.0 REFERENCES

7G300-02-JGF-009, 2002, "Transuranic Calculations for Twelve Tanks," (internal letter from S. R. Wilmarth to M. E. Johnson, October 2), CH2M HILL Hanford Group, Inc., Richland, Washington.

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.

ARH-95, 1967, *Chemical Processing Division Waste Status Summary*, July to September, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary*, October 15, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary*, January 20, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1608, 1970, *Radioactive Contamination in Liquid Wastes Discharged to Ground within the Separations Area Control Zone Through 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary*, April 30, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary*, July 21, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary*, October 26, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary*, April 28, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary*, March 7, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary*, March 7, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, *Chemical Processing Division Waste Status Summary*, November 1, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1972, *Chemical Processing Division Waste Status Summary*, February 4, 1972, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31*, 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doc/culrcs/mpd/toc.htm, U. S. Department of Energy, Richland Operations Office, Richland, Washington.

H-2-578, 1955, revision 5, *Waste Disposal System Plan & Details 241-T*, Hanford Engineering Works, General Electric Company, Richland, Washington

H-2-1988, 1950, *Sect-5 Waste Settling & Cribbing Schematic Layout*, Hanford Works, General Electric Company, Richland, Washington

H-2-2398, 1955, revision 1, *224-Bldg Waste Diversion to 241-111 Tank*, Hanford Works, General Electric Company, Richland, Washington

HAN-45762, 1946, *200 Area Daily Log for June 3, 1946 through December 31, 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944*, December 24, 1944 through December 29, 1946, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-45807-DEL, 1948, *200 Area Monthly Reports 1948*, Atomic Energy Commission, Richland Operations Office, Richland, Washington.

HNF-SD-RE-TI-178, 2003, Single-Shell Tank Leak Stabilization Record, Rev. 8, CH2MHILL Hanford Group Inc., Richland, Washington.

HNF-SD-WM-ER-351, 1997, *Historical Tank Waste Content Estimate for the Northwest Quadrant of the Hanford 200 West Area*, Rev. 1, Fluor Daniel Northwest Inc., Richland, Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, October 29, 1945, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10321, 1948, *Cribbing – Second Cycle Waste*, General Electric Company, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10728, 1948, *Process Waste Data – 200 Areas*, (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11908, 1948, *Audit of Radioactive Waste to Ground Through the 5-6 Crib Systems (January Through November 1948)*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-17088, 1950, *The Underground Disposal of Liquid Wastes at the Hanford Works, Washington*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington

HW-19898, 1951, *Efficiency Evaluation of the Dissolver Cell Silver Reactor and Fiberglas Filter*, General Electric Company, Richland, Washington

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington

HW-21826, 1951, *Variation in Silver Reactor Performance*, General Electric Company, Richland, Washington

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-25301, 1952, *Process Waste Disposal Summary – 200 Areas January through June 1952*, General Electric Company, Richland, Washington.

HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department*, April, May, June 1952, General Electric Company, Richland, Washington.

HW-28121, 1953, *Release of Radioactive Wastes to the Ground*, May 20, 1953, General Electric Company, Richland, Washington.

HW-33184, 1954, *BiPO4 Plant Nickel Ferrocyanide Scavenging Flowsheet for First Cycle Waste Containing No Coating Removal Waste*, General Electric Company, Richland, Washington

HW-33585-DEL, 1954 *Hanford Atomic Products Operation Monthly Report for October 1954*, General Electric Company, Richland, Washington

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-section, December 31, 1954, D. E. Peterson, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-section, January 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, March 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, April 30, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, May 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Thru June 1955*, General Electric Company, Richland, Washington.

HW-42219-DEL, 1956, *Hanford Atomic Products Operation for March 1956*, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, May 31, 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-44784, 1956, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1956*, General Electric Company, Richland, Washington.

HW-45707-DEL, 1956, *Chemical Processing Department Monthly Report for September 1956*, October 18, 1956, General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department*, Production Operation – Chemical Processing Department, September 30, 1956, General Electric Company, Richland, Washington.

HW-46432-DEL, 1956, *Chemical Processing Department Monthly Report for October 1956*, November 21, 1956, General Electric Company, Richland, Washington.

HW-48132-DEL, 1957, *Chemical Processing Department Monthly Report for January 1957*, February 21, 1957, General Electric Company, Richland, Washington.

HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through December 1956*, General Electric Company, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department*, Planning and Scheduling – Production Operation, April 30, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-51211-DEL, 1957, *Chemical Processing Department Monthly Report for June 1957*, General Electric Company, Richland, Washington.

HW-55176 – Pt. V, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.

HW-58051-DEL, 1958, *Chemical Processing Department Monthly Report for October 1958*, November 21, 1958, General Electric Company, Richland, Washington.

HW-59359, 1959, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1958*, General Electric Company, Richland, Washington.

HW-59434-DEL, 1959, *Chemical Processing Department Monthly Report for February 1959*, General Electric Company, Richland, Washington.

HW-62864-DEL, 1959, *Chemical Processing Department Monthly Report for November 1959*, December 21, 1959, General Electric Company, Richland, Washington.

HW-63646, 1960, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through June 1959*, General Electric Company, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65935-DEL, 1960, *Chemical Processing Department Monthly Report for June 1960*, General Electric Company, Richland, Washington.

HW-66271-DEL, 1960, *Chemical Processing Department Monthly Report for July 1960*, General Electric Company, Richland, Washington.

HW-72956, 1962, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1961*, General Electric Company, Richland, Washington.

HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.

HW-83906-D-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1959 through June 1961*, General Electric Company, Richland, Washington.

HW-83906-E-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports July 1961 through 1965*, General Electric Company, Richland, Washington.

ISO-98, 1966, *Radioactive Contamination in Liquid Wastes Discharged to Ground at the Separations Facilities Through December 1965*, ISOCHEM Inc., Richland, Washington.

ISO-226, 1966, *Chemical Processing Division – Waste Status Summary*, January 1, 1966 Through March 31, 1966, R. E. Roberts, ISOCHEM Inc., Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 Through September 30, 1966*, October 14, 1966, R. E. Roberts, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary*, Operations Analysis Waste Management Section Contract AT(45-1)-1851, Item G-9, January 23, 1967, R. E. Roberts, ISOCHEM Inc., Richland, Washington.

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

RMIS TFIC #D196235379, 1978, *Data Sheets Salt Well Transfer Tank T-111 to Tank T-101*, Rockwell Hanford Operations, Richland, Washington.

RMIS TFIC #D196235596, 1978, *Data Sheets Salt Well Transfer Tank T-110 to Tank T-101*, Rockwell Hanford Operations, Richland, Washington.

RPP-10983, 2002, *Tank Classifications Based on BBI and Gross Alpha*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-16129, 2004, *Origin of Waste in Single-Shell tank 241-T-104*, Revision 1, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-19822, 2004, *Hanford Defined Waste Model -Revision 5*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-TI-669, *Waste Status and Transaction Record Summary for the Northwest Quadrant of the Hanford 200 Area*, Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico.

APPENDIX A

VOLUME OF SOLIDS AND TOTAL WASTE IN TANKS 241-T-110, 241-T-111, AND 241-T-112

January 1945 through December 1975

This page intentionally left blank.

Reference	Year	Period	Cascade of Tanks T-110, T-111, and T-112						Comments from Reference Document
			Percent Filled						
HW-7-1293-DEL	1945	Jan	Not reported						
HW-7-1388-DEL, page 18		Feb	7.8%						
HW-7-1544-DEL, page 21		March	9.7%						
HW-7-1649-DEL, page 20		April	12.0%						
HW-7-1793-DEL, page 22		May	15.4%						
HW-7-1981-DEL, page 23		June	17.6%						
HW-7-2177-DEL, page 22		July	21.2%						
HW-7-2361-DEL, page 21		August	26.4%						
HW-7-2548-DEL, page 22		September	32.6%						"Technical Department work has demonstrated that the precipitate formed on neutralization will carry more residual product into the sludge at pH of 7 than at the pH of 9 to 10 previously used. Consequently, the second cycle wastes are now being neutralized to a pH of about 7. This may permit disposal of the supernatant solution through dry-wells at some future date ..."
HW-7-2706-DEL, page 21		October	38.7%						"The second decontamination cycle waste in tank (110) in the T Plant waste storage area was filled and began to cascade into the second tank of the series on about October 15."
HW-7-2957-DEL, page 21		November	49.0%						
HW-7-3171-DEL, page 21		December	58.5%						
HW-7-3378-DEL, page 24	1946	Jan	67.1%						
HW-7-3566-DEL, page 21		Feb	74.3%						
HW-7-3751-DEL, page 21		March	78.4%						
HW-7-4004-DEL, page 21		April	86.1%						
HW-7-4193-DEL, page 21		May	91.3%						

Reference	Year	Period	Cascade of Tanks T-110, T-111, and T-112						Comments from Reference Document
			Percent Filled						
HW-7-4343-DEL, page 23		June	97.5%						
HW-7-4542-DEL, page 21-22		July	100.0%						"The installation of a new underground line from diversion box 153 in the T Waste Area to the second cascade tank in the X104 series permitted the diversion, on 7-22-46, of second cycle waste and stack drainage from T Plant to the remaining two tanks in this series."
HW-7-4739-DEL, page 23		August	100.0%						2C waste transferred from 221-T into T-105, which cascades to T-106.
HW-7-5194-DEL, page 26		September	100.0%						
HW-7-5362-DEL, page 27-28		October	100.0%						"Tanks X-110-T, X-111-T and X-112-T in T Plant were checked by means of ionization chambers and it was determined that while the sludge level in the first tank was evenly distributed on the bottom of the tank to a depth of 38", there was no indication of sludge in the second and third tanks in the series." 38" of sludge corresponds to ~84,030-gallons.
HW-7-5505-DEL, page 28		November	100.0%						
HW-7-5630-DEL, page 25		December	100.0%						
HW-7-5802-DEL, page 26	1947	Jan	100.0%						
HW-7-5944-DEL, page 25		Feb	100.0%						"Excavation for an underground crib system and tile file adjacent to the 241 T Waste Storage Tank Farm in T Plant for the proposed handling of second cycle waste supernatants was started in February."
HW-7-6048-DEL, page 24		March	100.0%						
HW-7-6184-DEL, page 26		April	100.0%						
HW-7-6391-DEL, page 24		May	100.0%						
HW-7-7454-DEL, page 26		June	100.0%						
HEW-7283-DEL, page 26		July	100.0%						
HEW-7504-DEL, page 27		August	100.0%						
HW-7795-DEL, page 26-27		September	71.0%						"In T Plant, one tank, X-111-T, containing second cycle waste was disposed of to the recently installed underground crib system (Project C-120)."

Reference	Year	Period	Cascade of Tanks T-110, T-111, and T-112						Comments from Reference Document
			Percent Filled						
HW-7997-DEL, page 27		October	67.0%						2C waste transferred from 221-T into T-105, which cascades to T-106.
HW-8267-DEL, page 29		November	67.0%						"In order to safely complete the tie-in of the two lines from the 153-T diversion box to the X-111T and X-112T underground waste storage tanks, 20,000-gallons of second cycle waste were jetted from X-112T tank to the second cycle waste crib in T Plant. No further jetting of second cycle waste will be done until the perforating device mentioned in last month's report is available."
HW-8438-DEL, page 27		December	67.0%						2C waste transferred from 221-T into T-105, which cascades to T-106.
HW-8931-DEL, page 28	1948	Jan	67.0%						2C waste transferred from 221-T into T-105, which cascades to T-106.
HW-9191-DEL, page 30		Feb	67.0%						2C waste transferred from 221-T into T-105, which cascades to T-106.
HW-9595-DEL, page 32		March	70.8%						Tanks T-105 and T-106 are filled with 2C waste. 2C waste transferred from 221-T into cascade of T-110, T-111, and T-112.
HW-9922-DEL, page 31-32		April	75.1%						~360,000-gallons of 2C waste jetted from T-105 to crib.
HW-10166-DEL, page 33		May	79.3%						
HW-10378-DEL, page 30		June	84.1%						
HW-10714-DEL, page 32-33		July	89.0%						2C waste jetted from tank T-106 to crib.
HW-10993-DEL, page 35-36		August	67.5%						"The cribbing of tank X-112-T was started on August 4, 1948 and was nearing completion at month end."
HW-11226-DEL, page 32-33		September	66.0%						"At T Plant the cribbing of the X-112-T tank was discontinued after approximately 450,000 gallons of waste had been jetted to the crib to permit installation of an experimental sand filter for the purpose of determining the feasibility of removing the activity from the waste supernatant by this method prior to discharging it to the ground."
HW-11499-DEL, page 33-34		October	66.8%						"At T Plant, the cribbing of second cycle wastes in tank X-112-T was completed."
HW-11835-DEL, page 36		November	71.0%						
HW-12086-DEL, page 38		December	77.3%						

Reference	Year	Period	Cascade of Tanks T-110, T-111, and T-112						Comments from Reference Document
			Percent Filled						
HW-12391-DEL, page 39	1949	Jan	84.4%						
HW-12666-DEL, page 35		Feb	89.7%						
HW-12937-DEL, page 40-41		March	87.2%						"The cribbing of second cycle waste supernatant from X-112-T tank was started on March 17, 1949. At month end 151,250-gallons of this material has been jetted to the crib. Average age of material being cribbed is estimated to be nine months. Analysis of a sample of the waste being cribbed is as follows: AT 100 c/m/ml, Beta's 1730 c/m/ml, Gamma's 10 c/m/ml, pH 7.1, suspended solids 0.1%, Uranium nil.
HW-13190-DEL, page 39-40		April	71.0%						"The cribbing of second cycle waste from X-112-T tank which was started on March 17, 1949, was continued with a total of 319,000-gallons being jetted to the crib during this month."
HW-13561-DEL, page 41-41		May	71.9%						"The cribbing of second cycle waste from X-112-T tank, which was started in March, was completed with 55,000-gallons being cribbed during this month."
HW-13793-DEL, page 41		June	87.2%						Reported percent fill may be error.
HW-14043-DEL, page 43		July	77.6%						
HW-14338-DEL, page 44		August	81.9%						
HW-14596-DEL, page 43		September	86.2%						
HW-14916-DEL, page 44		October	92.4%						
HW-15267-DEL, page 43-45		November	82.6%						""In order to provide additional space for the storage and settling of second decontamination cycle wastes in the X-110-T series of tanks in the 241-T area, cribbing of supernatant from X-112-T (final tank in 110-T series) was resumed on November 18 ...". "Cribbing of 215,000-gallons of supernatant was completed during the month."
HW-1550-DEL, page 42-43		December	69.4%						"Cribbing of 578,000-gallons of second cycle waste from X-112-T tank in the 200 West Area was concluded on December 19, for a total of 2,955,000-gallons of this type waste cribbed in the 200 West Area since cribbing of second cycle supernatant was first initiated."
HW-15843-DEL, page 45	1950	Jan	76.2%						
HW-17056-DEL, page 45		Feb	81.8%						
HW-17410-DEL, page 47-49		March	89.9%						"A total of 27,300-gallons of second cycle decontamination waste having its origin from the bismuth phosphate process semi-works, which was formerly operated in the 300 Area, was placed in the X-112-T waste storage tank during this month."

Reference	Year	Period	Cascade of Tanks T-110, T-111, and T-112						Comments from Reference Document
			Percent Filled						
HW-17660-DEL, page 46-47		April	92.0%						"Cribbing of supernatant from X-112-T second cycle waste storage tank in the 200 West Area was started late in the month when this tank became 85% filled".
HW-17971-DEL, page 44-45		May	71.9%						"In 200 West Area, the cribbing of supernatant from X-112-T second cycle waste storage tank, started late in April, has totaled 462,000-gallons to date".
HW-18221-DEL, page 43-45		June	70.8%						"Approximately 129,000-gallons of second cycle waste supernatant were cribbed during the month from the 112-T tank in 200 West Area".
HW-18473-DEL, page 46		July	79.5%						
HW-18740-DEL, page 50		August	89.4%						
HW-19021-DEL, page 49		September	97.2%						

Reference	Year	Period	Cascade of Tanks T-110, T-111, and T-112 Waste Volume (x 1000 gallons)						Comments from Reference Document
HW-19325-DEL, page 49-50		October	1382						"With the X-112-B and X-112-T tanks each becoming half full during the month, cribbing of the second decontamination cycle waste from each was resumed. A total of 327,250-gallons in T Plant and 507,700 gallons in B Plant had been cribbed by month end without incident."
HW-19622-DEL, page 49		November	1154						"A total of 349,250-gallons of second decontamination cycle waste supernatant was cribbed from X-112-T tank in the 200 West Area during the month."
HW-19842-DEL, page 50-51		December	1073						"Disposal of second decontamination cycle waste to underground cribs was made in December as tabulated below: 200 East Area from tank X-112-B: 249,000-gallons 200 West Area from tank X-112-T: 118,200-gallons
HW-20161-DEL, page 50	1951	Jan	1297						
HW-20438-DEL, page 50		Feb	1448						"Cribbed as necessary."
HW-20671-DEL, page 54		March	1467						"143,000-gallons cribbed from 112-T."
HW-20991-DEL, page 52-53		April	1596						"Cribbed when necessary." "The tie-line from tank 241-T-112 to the 241-T crib was completed during the month on Project C-415, which will allow constant overflow of settled second decontamination cycle waste in conjunction with Section 5 waste." [Section 5 waste is low-activity cell drainage from T Plant tank 5-6]
HW-21250-DEL, page 56-57		May	1629						"185,600-gallons estimated cribbed by cascade." "The settled second cycle decontamination cycle waste started to overflow constantly from the 241-T-112 tank on May 8, 1951 and has continued uneventfully since that time. It is expected that Section 5 waste effluents, originating in the Canyon Buildings, will be combined with second cycle decontamination wastes at both B and T Plants, during June."
HW-21506-DEL, page 55		June	1629						"Cascades to Crib". "... parallel changes were completed in both the 200 East and West Areas, whereby the Section 5 waste effluents, originating in the Canyon Buildings, were combined with the second decontamination cycle waste facilities, rather than being discharged directly to underground cribs."
HW-21802-DEL, page 41		July	1629						"Cascades to Crib".
HW-22075-DEL		August	Not reported						
HW-22304-DEL		September	Not reported						
HW-22610-DEL		October	Not reported						
HW-22875-DEL		November	Not reported						
HW-23140-DEL		December	Not reported						

Reference	Year	Period	T-110	T-110	T-111	T-111	T-112	T-112	Comments from Reference Document
			Waste Volume (x 1000 gallons)						
			Total	Sludge	Total	Sludge	Total	Sludge	
no report	1952	Jan							Hanford Site monthly reports only list percent filled for cascade prior to 1952.
HW-27897		Feb							No information on individual tanks
HW-27898		March	530	Not reported	530	Not reported	569	Not reported	T-110, T-111, T-112 operate as cascade and receive 2C waste. T-112 cascades to crib.
HW-27838		April to June	530	Not reported	530	Not reported	569	Not reported	On 5-29-52, 224-T wastes were tied into 5-6 stream feeding to 110-111-112-T at diversion box 241-T-152.
HW-27839		July to Sept.	530	Not reported	530	Not reported	569	Not reported	5-6, 2C and 224 waste routed to these tanks. T-112 cascades to crib.
HW-27840		Oct. to Dec.	530	Not reported	530	Not reported	569	Not reported	
HW-27841	1953	Jan	530	530	530	191	569	28	
HW-27842		Feb	530	530	530	191	519	28	
HW-27775		March	530	530	530	191	569	29	
HW-28043		April	530	530	530	233	569	34	
HW-28377		May	530	530	539	235	569	35	
HW-28712		June	530	530	530	246	569	45	
HW-29054		July	530	530	530	252	569	50	
HW-29242		August	530	521	530	186	569	2	
HW-29624		September	530	521	530	213	569	2	
HW-29905		October	530	522	530	220	564	5	
HW-30250		November	530	523	530	229	569	6	
HW-30498		December	530	530	530	230	569	7	
HW-30851	1954	Jan	530	530	530	245	569	12	
HW-31126		Feb	530	530	530	277	569	22	
HW-31374		March	530	530	530	299	569	33	
HW-31811		April	530	530	530	299	569	33	
HW-32110		May	530	530	530	299	569	33	
HW-32389		June	530	530	530	312	569	33	
HW-32697		July	530	530	530	345	569	33	
HW-33002		August	530	530	530	355	569	33	
HW-33396		September	Illegible	Illegible	Illegible	Illegible	Illegible	Illegible	
HW-33544		October	530	530	530	377	569	33	
HW-33904		November	530	530	530	417	569	33	
HW-34412		December	530	530	530	439	569	33	T-110 full of sludge. T-111 and T-112 active 2C and 224 waste cascade to crib.
HW-35022	1955	Jan	530	530	530	464	569	33	
HW-35628		Feb	530	530	530	430	569	33	T-111 and T-112 active 2C and 224 waste cascade to crib.

Reference	Year	Period	T-110	T-110	T-111	T-111	T-112	T-112	Comments from Reference Document
			Waste Volume (x 1000 gallons)						
			Total	Sludge	Total	Sludge	Total	Sludge	
HW-36001		March	530	530	530	487	569	33	T-111 and T-112 active 2C and 224 waste cascade to crib.
HW-36553		April	530	530	398	362	322	166	T-111 pumping to T-112 at month end. 833,000-gallons supernatant pumped to open ditch.
HW-37143		May	530	530	530	387	569	170	T-112 cascades to crib.
HW-38000		June	530	530	530	402	569	170	T-112 cascades to crib.
HW-38401		July	530	530	530	408	569	170	
HW-38926		August	530	530	530	417	569	170	
HW-39216		September	530	530	530	430	569	170	
HW-39850		October	530	530	530	440	569	170	
HW-40208		November	530	530	530	465	569	170	
HW-40816		December	530	530	530	465	569	170	T-112 pumps to crib at intervals.
HW-41038	1956	Jan	530	530	530	482	442	170	T-112 pumps to crib at intervals.
HW-41812		Feb	530	530	530	499	472	170	
HW-42394		March	530	530	530	507	439	170	
HW-42993		April	530	530	530	510	441	170	
HW-43490		May	530	530	530	510	435	170	
HW-43895		June	530	530	530	510	429	170	T-111 Receives from T Plant. T-112 pumps to crib at intervals.
HW-44860		July	530	530	530	510	429	170	
HW-45140		August	530	530	530	510	429	170	
HW-45738		September	530	530	530	510	429	170	
HW-46382		October	530	530	530	Not reported	439	Not reported	
HW-47052		November	530	530	530	510	451	170	
HW-47640		December	530	530	530	510	470	170	
HW-48144	1957	Jan	481	530	543	510	475	170	T-112 estimated reading.
HW-48846		Feb	481	530	554	510	475	170	T-112 estimated reading.
HW-49523		March	481	530	560	510	422	170	T-112 latest electrode reading.
HW-50127		April	483	530	560	510	417	170	
HW-50617		May	527	530	560	510		170	HW-50617 not legible. Values from HW-83906-C-RD, page 46. Corrected T-110 reading.
HW-51348		June	527	530	560	510	448	170	
HW-51858		July	527	530	557	510	414	170	
HW-52414		August	527	46	557	510	417	170	
HW-52932		September	527	46	557	510	417	170	
HW-53573		October	527	46	557	510	417	170	
HW-54067		November	527	46	557	510	417	170	

Reference	Year	Period	T-110	T-110	T-111	T-111	T-112	T-112	Comments from Reference Document
			Waste Volume (x 1000 gallons)						
			Total	Sludge	Total	Sludge	Total	Sludge	
HW-54519		December	527	46	557	510	417	170	
HW-54916	1958	Jan	527	46	557	510	417	170	
HW-55264		Feb	527	46	557	510	420	170	
HW-55630		March	527	46	557	510	420	170	
HW-55997		April	527	46	557	510	420	170	
HW-56357		May	527	46	524	510	420	170	Corrected calculation for T-111 waste volume.
HW-56761		June	527	46	524	510	420	170	
HW-57122		July	527	46	524	510	420	170	
HW-57550		August	527	46	524	510	420	170	
HW-57711		September	527	46	527	510	420	170	
HW-58201		October	527	46	527	510	422	170	
HW-58579		November	527	46	527	510	425	170	
HW-58831		December	527	46	527	510	425	170	
HW-59204	1959	Jan	527	46	527	510	425	170	
HW-59586		Feb	527	46	524	510	439	170	
HW-60065		March	524	46	524	510	439	170	
HW-60419		April	524	46	524	510	439	170	
HW-60738		May	524	46	524	510	442	170	
HW-61095		June	524	46	524	510	444	170	
HW-61582		July	524	46	524	510	444	170	
HW-61952		August	524	46	524	510	444	170	
HW-62421		September	524	46	524	510	442	170	
HW-62723		October	524	46	524	510	442	170	
HW-63083		November	524	46	524	510	442	170	
HW-63559		December	524	46	527	510	442	170	T-111 received 2,750-gallons of waste from 221-T (HW-83906-D-RD, page 92).
HW-63896	1960	Jan	524	46	527	510	442	170	
HW-64373		Feb	524	46	527	510	447	170	
HW-64810		March	524	46	527	510	450	170	T-112 received 3,000-gallons 221-T waste.
HW-65272		April	524	46	527	510	450	170	
HW-65643		May	524	46	527	510	422	170	T-112 received 16,000-gallons from 221-T. Pumped out to TY crib 44,000-gallons.
HW-66187		June	524	46	527	510	429	170	T-112 received 7,000-gallons from 221-T.
HW-66557		July	524	46	527	510	461	170	T-112 received 32,000-gallons from 221-T.
HW-66827		August	524	46	527	510	461	170	

Reference	Year	Period	T-110	T-110	T-111	T-111	T-112	T-112	Comments from Reference Document
			Waste Volume (x 1000 gallons)						
			Total	Sludge	Total	Sludge	Total	Sludge	
HW-67696		September	524	46	527	510	461	170	
HW-67705		October	524	46	527	510	461	170	
HW-68291		November	524	46	527	510	461	170	
HW-68292		December	524	46	529	510	403	170	T-112 jetted 58,000-gallons to TY crib.
HW-71610	1961	Jan. to June	524	46	527	510	395	170	T-112 received 221-T waste and pumped to TY crib.
HW-83906-D-RD pg. 197	*1961*	*Jan. to June*	*524*	*530*	*521*	*510*	*396*	*170*	*T-111 cascades to T-112. T-112 receives 221-T crib waste and pumps to TY crib.*
HW-72625	1961	Jul to Dec.	524	46	527	510	395	170	
HW-83906-E-RD pg. 8	*1961*	*Jul to Dec.*	*524*	*530*	*527*	*510*	*395*	*170*	*T-111 receives waste from 221-T. Cascades to T-112, which is pumped to TY crib.*
HW-74647	1962	Jan. to June	524	46	524	510	442	170	221-T waste cascades from T-111 to T-112 and then pumped to cribs.
HW-76223	1962	Jul to Dec.	524	46	524	510	395	170	221-T waste cascades from T-111 to T-112 and then pumped to cribs.
HW-78279	1963	Jan. to June	524	46	524	510	395	170	221-T waste cascades from T-111 to T-112 and then pumped to cribs.
HW-80379	1963	Jul to Dec.	524	46	524	510	430	170	T-111 received wastes from 221-T cascades to T-112, which is pumped to TY crib.
HW-83308	1964	Jan. to June	524	46	524	510	430	170	221-T waste cascades from T-111 to T-112 and then pumped to cribs.
HW-83906-E-RD pg. 58	1964	Jul to Dec.	524	46	524	510	433	170	T-111 received wastes from 221-T cascades to T-112, which is pumped to TY crib.
HW-83906-E-RD pg. 64	1965	Jan. to June	530	46	541	510	442	170	T-111 received wastes from 221-T cascades to T-112, which is pumped to TY crib.
HW-83906-E-RD pg. 70	1965	July to Sept.	530	46	537	510	447	170	T-111 receives waste from 221-T, cascades to T-112, which is pumped to the TY crib.
HW-83906-E-RD pg. 78	1965	Oct. to Dec.	530	46	540	510	408	170	T-111 receives waste from 221-T. T-112 waste pumped to TY crib.
no report	1966	Jan. to March							
HW-83906-E-RD pg. 86	1966	April to June	530	46	539	510	425	170	T-111 receives waste from 221-T. Cascades to 112-T, pumped to TY crib.
ISO-538	1966	July to Sept.	532	508	538	442	392	40	221-T waste cascades from T-111 to T-112, then pumps to cribs.
ISO-674	1966	Oct. to Dec.	532	508	538	442	392	40	221-T waste cascades from T-111 to T-112, then pumps to cribs.
ISO-806	1967	Jan. to March	532	508	538	442	508	40	221-T waste cascades from T-111 to T-112, then pumps to cribs.
ISO-967	1967	April to June	534	508	538	442	362	40	Transferred 146,000-gallons from T-112 to TX-118.
									Beginning in July 1967, waste status summary reports indicate that equipment decontamination waste from 221-T Plant was routed to T-112.
ARH-95	1967	July to Sept.	534	508	538	442	73	40	289,000-gallons transferred from T-112 to TX-118
ARH-326	1967	Oct. to Dec.	534	508	540	442	371	170	T-112 Received 298,000-gallons from 221-T

Reference	Year	Period	T-110	T-110	T-111	T-111	T-112	T-112	Comments from Reference Document
			Waste Volume (x 1000 gallons)						
			Total	Sludge	Total	Sludge	Total	Sludge	
ARH-534	1968	Jan. to March	535	46	538	510	508	170	T-112 Received 141,000-gallons from 221-T
ARH-721	1968	April to June	534	508	538	442	237	40	T-112 Transferred 382,000-gallons to REDOX Evaporator. Received 111,000-gallons from 221-T.
ARH-871	1968	July to Sept.	534	508	538	442	365	40	T-112 Transferred 125,000-gallons to REDOX Evaporator. Received 253,000-gallons from 221-T.
ARH-1061	1968	Oct. to Dec.	534	508	538	447	266	24	T-112 Transferred 354,000-gallons to REDOX Evaporator. Received 255,000-gallons from 221-T.
ARH-1200 A	1969	Jan. to March	534	508	538	447	406	24	T-112 Transferred 86,000-gallons to REDOX Evaporator. Received 226,000-gallons from 221-T.
ARH-1200 B	1969	April to June	534	508	538	447	165	24	T-112 Transferred 20,000-gallons to REDOX Evaporator. Received 227,000-gallons from 221-T. Transferred 448,000 to 103-TY.
ARH-1200 C	1969	July to Sept.	534	508	538	447	354	24	T-112 received 189,000-gallons of decontamination waste from 221-T Plant.
ARH-1200 D	1969	Oct. to Dec.	534	293	537	233	174	33	T-112 received 232,000-gallons of decontamination waste from 221-T Plant. T-112 transferred 413,000-gallons to REDOX evaporators.
ARH-1666 A	1970	Jan. to March	534	293	539	233	290	33	T-112 Transferred 111,000-gallons to REDOX Evaporator. Received 228,000-gallons from 221-T.
ARH-1666 B	1970	April to June	534	293	538	233	343	32	T-112 Transferred 109,000-gallons to REDOX Evaporator. Received 161,000-gallons from 221-T.
ARH-1666 C	1970	July to Sept.	534	293	539	233	351	32	T-112 Transferred 132,000-gallons to REDOX Evaporator. Received 140,000-gallons from 221-T.
ARH-1666 D	1970	Oct. to Dec.	534	293	539	233	370	32	T-112 Transferred 119,000-gallons to REDOX Evaporator. Received 138,000-gallons from 221-T.
ARH-2074 A	1971	Jan. to March	534	293	540	233	395	32	T-112 Transferred 76,000-gallons to REDOX Evaporator. Received 100,000-gallons from 221-T.
ARH-2074 B	1971	April to June	534	293	545	233	298	32	T-112 Transferred 244,000-gallons to REDOX Evaporator. Received 147,000-gallons from 221-T.
ARH-2074 C	1971	July to Sept.	534	293	539	233	342	32	T-112 Transferred 116,000-gallons to REDOX Evaporator. Received 160,000-gallons from 221-T.
ARH-2074 D	1971	Oct. to Dec.	534	293	541	233	399	32	T-112 Transferred 87,000-gallons to REDOX Evaporator. Received 144,000-gallons from 221-T.
ARH-2456 A	1972	Jan. to March	535	293	538	233	378	32	T-112 Transferred 260,000-gallons to REDOX Evaporator. Received 237,000-gallons from 221-T.
ARH-2456 B	1972	April to June	535	293	540	233	404	32	T-112 Transferred 146,000-gallons to REDOX Evaporator. Received 174,000-gallons from 221-T.

Reference	Year	Period	T-110	T-110	T-111	T-111	T-112	T-112	Comments from Reference Document
			Waste Volume (x 1000 gallons)						
			Total	Sludge	Total	Sludge	Total	Sludge	
PPD-493-7-DFL									REDOX Evaporators shutdown 7-5-1972. Waste to be stored in tanks and processed in 242-T or 242-S evaporators.
ARH-2456 C	1972	July to Sept.	535	293	539	233	468	32	T-112 received 136,000-gallons of decontamination waste from 221-T Plant. T-112 transferred 71,000-gallons to U-107.
ARH-2456 D	1972	Oct. to Dec.	535	293	539	233	329	32	T-112 received 148,000-gallons of decontamination waste from 221-T Plant. T-112 transferred 286,000-gallons to U-107.
ARH-2794A	1973	Jan. to March	536	293	536	233	217	32	T-112 Transferred 332,000-gallons to 107-U. T-112 received 199,000-gallons from 221-T and 20,000-gallons from 301-T catch tank
ARH-2794 B	1973	April to June	536	293	536	233	508	32	T-112 Transferred 180,000-gallons to 107-U. T-112 Received 120,000-gallons from 221-T and 350,000-gallons from 106-T.
ARH-2794 C	1973	July to Sept.	531	293	535	233	505	32	
ARH-2794 D	1973	Oct. to Dec.	531	293	534	233	505	32	221-T Decontamination solution routed to U-107
ARH-CD-133A	1974	Jan. to March	531	293	534	233	505	32	
ARH-CD-133B	1974	April to June	475	293	490	233	236	32	Transferred 59,000-gallons from T-110 to S-110, 28,000-gallons from T-111 to S-110, 14,000 from T-111 to T-109, and 273,000 from T-112 to S-110.
ARH-CD-133C	1974	July to Sept.	483	293	485	485	101	32	Transferred 8,000-gallons of water into T-110. Transferred 136,000-gallons from T-112 to S-110.
ARH-CD-133D	1974	Oct. to Dec.	483	466	488	488	101	32	T-111 removed from service.
ARH-CD-336A	1975	Jan. to March	483	466	488	488	101	32	
ARH-CD-336B	1975	April to June	483	466	488	488	101	32	
ARH-CD-336C	1975	July to Sept.	483	466	488	488	101	32	
ARH-CD-336D	1975	Oct. to Dec.	483	466	488	488	101	32	

A1.0 REFERENCES

ARH-95, 1967, *Chemical Processing Division Waste Status Summary*, July to September, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary*, January 15, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary*, April 16, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary*, July 15, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary*, October 21, 1968, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary*, January 17, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200A, 1969, *Chemical Processing Division Waste Status Summary*, April 15, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary*, July 16, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary*, October 15, 1969, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary*, January 20, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary*, April 30, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary*, July 21, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary*, October 26, 1970, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary*, April 28, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary*, March 7, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary,* March 7, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, *Chemical Processing Division Waste Status Summary,* November 1, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1972, *Chemical Processing Division Waste Status Summary,* February 4, 1972, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972,* Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July1, 1972 through September 30, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31,* 1973, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary July 1, 1973 through September 30, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975,* Atlantic Richfield Hanford Company, Richland, Washington.

HW-7-1293-DEL, 1945, *Hanford Engineering Works Monthly Report January 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945,* E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3171-DEL, 1946,*Hanford Engineering Works Monthly Report December 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*, April 5, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*, July 10, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HEW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HEW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.

HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.

HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.

HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.

HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.

HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.

HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.

HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.

HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.

HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.

HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.

HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.

HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.

HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.

HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.

HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, November 18, 1949, General Electric Company, Richland, Washington.

HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.

HW-1550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.

HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.

HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21250-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.

HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.

HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.

HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.

HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.

HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations,* March 31, 1953, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department,* April, May, June 1952, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section,* July, August, September 1952, General Electric Company, Richland, Washington.

HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section,* October, November, December 1952, General Electric Company, Richland, Washington.

HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section,* January 1953, General Electric Company, Richland, Washington.

HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section*, February 1953,General Electric Company, Richland, Washington.

HW-27897, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section,* General Electric Company, Richland, Washington.

HW-27898, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section,* March 1952, General Electric Company, Richland, Washington.

HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations,* April 30, 1953, General Electric Company, Richland, Washington.

HW-28377, 1953, *Waste-Status Summary, Separations Section,* Planning and Scheduling, Separations - Operations, May 31, 1953, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-28712, 1953, *Waste-Status Summary, Separations Section*, Planning and Scheduling, Separations – Operations, June 30, 1953, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-29054, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, July 31, 1953, J. P. McBride, General Electric Company, Richland, Washington.

HW-29242, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, August 31, 1953, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-29624, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, September 30, 1953, G.K. Carpenter, General Electric Company, Richland, Washington.

HW-29905, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, October 31, 1953, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-30250, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, November 30, 1953, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-30498, 1953, *Waste-Status Summary, Separations Section* Planning and Scheduling, Separations, December 31, 1953, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-30851, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Operations, January 31, 1954, G. K. Carpenter, General Electric Company, Richland, Washington.

HW–31126, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Operations, February 1954, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-31374, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Operations, March 31, 1954, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-31811, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Operations, April 30, 1954, G. K. Carpenter, General Electric Company, Richland, Washington.

HW-32110, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Operations, May 31, 1954, G. K. Carpenter, General Electric Company, Richland, Washington

HW-32389, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Operations, June 30, 1954, D. E. Peterson, General Electric Company, Richland, Washington.

HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations* – Engineering and Control, July 31, 1954, D. E. Peterson, General Electric Company, Richland, Washington

HW-33002, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations – Projects and Personnel Development Sub-section, August 31, 1954, D. E. Peterson, General Electric Company, Richland, Washington.

HW-33396, 1954, *Waste- Status Summary; Separations Section*, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, September 31, 1954, D. E, Peterson, General Electric Company, Richland, Washington.

HW-33544, 1954, *Waste- Status Summary; Separations Section*, Separations –Projects and Personnel Development Sub-section, October 31, 1954, General Electric Company, Richland, Washington.

HW-33904, 1954, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-section, November 30, 1954, General Electric Company, Richland, Washington.

HW-34412, 1954, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-section, December 31, 1954, D. E. Peterson, General Electric Company, Richland, Washington.

HW-35022, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-section, January 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-35628, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, February 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, March 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, April 30, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, May 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, June 30, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, July 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, August 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, September 30, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, October 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, November 30, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, December 31, 1955, D. E. Peterson, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-section, January 31, 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-41812, 1956, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, February 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-42394, 1956, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, March 31, 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-42993, 1956, *Waste- Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, April 30, 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-43490, 1956, *Waste-Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, May 31, 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-43895, 1956, *Waste-Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, June 30, 1956, D. E. Peterson, General Electric Company, Richland, Washington.

HW-44860, 1956, *Waste-Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, July 31, 1956,General Electric Company, Richland, Washington.

HW-45140, 1956, *Waste-Status Summary; Separations Section*, Separations – Projects and Personnel Development Sub-Section, August 31, 1956, General Electric Company, Richland, Washington.

HW-45738, 1956, *Waste-Status Summary; Chemical Processing Department*, Production Operation – Chemical Processing Department, September 30, 1956, General Electric Company, Richland, Washington.

HW-46382, 1956, *Waste-Status Summary; Chemical Processing Department*, Planning and Scheduling – Production Operation, October 1956, General Electric Company, Richland, Washington.

HW-47052, 1956, *Waste-Status Summary; Chemical Processing Department*, Planning and Scheduling Production Operation, November 30, 1956, General Electric Company, Richland, Washington.

HW-47640, 1956, *Waste-Status Summary; Chemical Processing Department*, Planning and Scheduling – Production Operation, December 31, 1956, General Electric Company, Richland, Washington.

HW-48144, 1957, *Waste-Status Summary; Chemical Processing Department*, Planning and Scheduling – Production Operation, January 31, 1957, R. E. Roberts, Hanford Atomic Products, Richland, Washington.

HW-48846, 1957, *Waste-Status Summary; Chemical Processing Department*, Planning and Scheduling – Production Operation, February 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-49523, 1957, *Waste-Status Summary; Chemical Processing Department*, Planning and Scheduling – Production Operation, March 31, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department,* Planning and Scheduling – Production Operation, April 30, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-50617, 1957, *Waste- Status Summary; Chemical Processing Department,* Planning and Scheduling – Production Operation, May 31, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-51348, 1957, *Waste- Status Summary; Chemical Processing Department,* Planning and Scheduling – Production Operation, June 30, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department,* Planning and Scheduling – Production Operation, July 31, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department,* Planning and Scheduling – Production Operation, August 31, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department,* Planning and Scheduling – Production Operation, September 30, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department,* October 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-54067, 1957, *Waste- Status Summary; Chemical Processing Department*, November 30, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-54519, 1957, *Waste- Status Summary; Chemical Processing Department,* December 31, 1957, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-54916, 1958, *Waste- Status Summary; Chemical Processing Department,* January 31, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-55264, 1958, *Waste- Status Summary; Chemical Processing Department,* February 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-55630, 1958, *Waste- Status Summary; Chemical Processing Department,* March 31, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-55997, 1958, *Waste- Status Summary; Chemical Processing Department,* April 30, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-56357, 1958, *Waste-Status Summary; Chemical Processing Department*, May 31, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-56761, 1958, *Waste-Status Summary; Chemical Processing Department*, June 30, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-57122, 1958, *Waste-Status Summary; Chemical Processing Department*, July 31, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-57550, 1958, *Waste-Status Summary; Chemical Processing Department*, August 31, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-57711, 1958, *Waste-Status Summary; Chemical Processing Department*, September 30, 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-58201, 1958, *Waste-Status Summary; Chemical Processing Department*, October 1958, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-58579, 1958, *Waste-Status Summary; Chemical Processing Department*, December 16, 1958, M. A. Thress, Hanford Atomic Products Operation, Richland, Washington.

HW-58831, 1959, *Waste-Status Summary; Chemical Processing Department*, January 12, 1959, M. A. Thress, Hanford Atomic Products Operation, Richland, Washington.

HW-59204, 1959, *Waste-Status Summary; Chemical Processing Department*, February 10, 1959, M. A. Thress, Hanford Atomic Products Operation, Richland, Washington.

HW-59586, 1959, *Waste-Status Summary; Chemical Processing Department*, March 10, 1959, M. A. Thress, Hanford Atomic Products Operation, Richland, Washington.

HW-60065, 1959, *Waste-Status Summary; Chemical Processing Department*, April 16, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-60419, 1959, *Waste-Status Summary; Chemical Processing Department*, May 18, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-60738, 1959, *Waste-Status Summary; Chemical Processing Department*, June 15, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-61095, 1959, *Waste-Status Summary; Chemical Processing Department*, July 14, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-61582, 1959, *Waste-Status Summary; Chemical Processing Department*, August 18, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department*, September 17, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department*, October 19, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department*, November 12, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department*, December 15, 1959, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department*, January 19, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-63896, 1960, *Chemical Processing Department – Waste Status Summary*, February 12, 1960,J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-64373, 1960, *Chemical Processing Department – Waste Status Summary*, March 17, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960*, General Electric Company, Richland, Washington.

HW-65272, 1960, *Chemical Processing Department – Waste Status Summary*, May 18, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960*, General Electric Company, Richland, Washington.

HW-66187, 1960*Chemical Processing Department – Waste Status Summary*, July 25, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-66557, 1960, *Chemical Processing Department – Waste Status Summary*, August 22, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-66827, 1960, *Chemical Processing Department – Waste Status Summary*, September 20, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-67696, 1960, *Chemical Processing Department – Waste Status Summary*, November 29, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-67705, 1960, *Chemical Processing Department – Waste Status Summary*, November 30, 1960, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-68291, 1961, *Chemical Processing Department – Waste Status Summary*, January 25, 1961, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-68292, 1961, *Chemical Processing Department – Waste Status Summary*, January 30, 1961, J. E. Lentz, Hanford Atomic Products Operation, Richland, Washington.

HW-71610, 1961, *Chemical Processing Department – Waste Status Summary*, November 6, 1961, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-72625, 1962, *Chemical Processing Department – Waste Status Summary*, February 7, 1962, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department – Waste Status Summary*, Planning and Scheduling Production Operation, August 8, 1962, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-76223, 1962, *Chemical Processing Department – Waste Status Summary*, Planning and Scheduling Production Operation, July – December 1962, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-78279, 1963, *Chemical Processing Department – Waste Status Summary*, June 1963, Planning and Scheduling Production Operation, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-80379, 1964, *Chemical Processing Department – Waste Status Summary*, January 9, 1964, Planning and Scheduling Production Operation, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-83308, 1964, *Chemical Processing Department – Waste Status Summary*, July 15, 1964, Planning and Scheduling Production Operation, R. E. Roberts, Hanford Atomic Products Operation, Richland, Washington.

HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.

HW-83906-D-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1959 through June 1961*, General Electric Company, Richland, Washington.

HW-83906-E-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports July 1961 through 1965*, General Electric Company, Richland, Washington.

ISO-538, 1966, *Chemical Processing Division – Waste Status Summary*, October 14, 1966, R. E. Roberts, ISOCHEM INC., Richland, Washington.

ISO-674, 1967, *Chemical Processing Division Waste Status Summary*, Operations Analysis Waste Management Section Contract AT(45-1)-1851, Item G-9, January 23, 1967, R. E. Roberts, ISOCHEM Inc., Richland, Washington.

ISO-806, 1967, *Chemical Processing Division-Waste Status Summary*, April 5, 1967, R. E. Roberts, ISOCHEM INC., Richland, Washington.

ISO-967, 1967, *Chemical Processing Division-Waste Status Summary*, July 12, 1967, ISOCHEM INC., Richland, Washington.

PPD-493-7-DEL, 1972, *Monthly Status and Progress Report for July 1972*, Atomic Energy Commission, Richland, Washington.

CH2M HILL DOCUMENT RELEASE FORM

(1) Document Number:	RPP-13300	(2) New Revision Number: 1	☐ New ☐ Page Change ☑ Full Revision ☐ Cancel
(3) Impacted Documents:	none	(4) File Index Number:	
		(5) Effective Date:	December 16, 2004

(6) Document Title: Origin of Wastes in the B-200 and T-200 Series Single-Shell Tanks

(7) Change/Release Description: see Record of Revision form

(8) Change Justification: Incorporated additional information on wastes types discharged to B-200 and T-200 series tanks. Revised tank waste characterization discussion to reflect tank waste information network system information as of October 2004.

(9) Approvals:

(a) Author (Print/Sign): Michael E. Johnson	Michael E Johnson	Date: 12/15/2004
(b) Responsible Manager (Print/Sign): Stewart M. Mackay	SMackay	Date: 12/15/2004
(c) Reviewer (Optional, Print/Sign):		Date:
(d) Reviewer (Optional, Print/Sign):		Date:

(10) Distribution:

(a) Name	(b) MSIN	(a) Name	(b) MSIN
K. D. Boomer	H6-19	B. A. Higley	R2-12
M. J. Jennings	H6-03	J. G. Kristofzski	H6-03
S. M. Mackay	R2-58	D. E. Place	R2-12
A. Tedeschi	H6-19	W. Bryan	H6-19

(11) No. of Pages: ~~179~~ 178 N.F. 12-16-04

Release Stamp

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

(12) HDCS? ☑ Yes ☐ No

(13) Release Type: ☑ Public Release ☐ Internal Release

(14) Release Approval (Print/Sign): J. D. Aardal / Janis Aardal Date: 12-16-2004

A-6003-881 (08/04)

RPP-13300, Rev. 1

ORIGIN OF WASTES IN THE B-200 AND T-200 SERIES SINGLE-SHELL TANKS

M. E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352

U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 821328
Cost Center: 501546
B&R Code:
UC:
Charge Code:
Total Pages: ~~176~~ 178 MF 12-16-04

Key Words: Hanford, single-shell tank, B-201, B-202, B-203, B-204, T-201, T-202, T-203, T-204, 224 building waste

Abstract: Tanks B-201 through B-204 and T-201 through T-204 received waste from the plutonium concentration activities conducted in the 224-B and 224-T buildings from October 1946 through June 1952. Tanks B-201 through B-204 also received miscellaneous flush solutions from deactivation activities conducted in the 221-B Bismuth Phosphate Plant and the 224-B building.

J. Aardal 12-16-04

Release Approval   Date

DEC 16 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

Release Stamp

Approved For Public Release

Tank Farm Contractor (TFC) RECORD OF REVISION	(1) Document Number RPP-13300	Page 1

(2) Title
Origin of Wastes in the B-200 and T-200 Series Single-Shell Tanks

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release: (5) Resp. Engr. (print/sign/date)	Authorized for Release: (6) Resp. Mrg. (print/sign/date)
RS 1	Add - Section 2.1: Added discussion that plutonium precipitate separated from uranium and fission products was washed three times and the wash water combined with the uranium and fission product solution. Add - Section 2.1: Spent nuclear fuel reprocessing completed in the 221 BiPO4 process when plutonium was separated from the metal waste. Add: Figure 1: Added "Wastes Streams from" Bismuth Phosphate Process to figure title. Add: Section 2.2.1: Included the word "Plant" after "221" designation. Included the word "building" after "224" designation. Add - Section 3: Expanded discussion on types of records reviewed and information available in each of these records. Add - Section 3.2: Discussed the dissolvers metal waste equipment and other equipment in the 221-B Plant were flushed with nitric acid from July 1952 through September 1952, which would have removed any residual high-levle waset present in this equipment. Therefore, equipment flushing conducted after the nitric acid flushing would not have generated high-level waste. Discussed the water flushes of equipment conducted during 1954 through 1955 were discharged to cribs and cited reference documents. Add - Sections 3.4.1.1 & 3.4.2: Discussed certain historical records were not declassified until the 1990's which would have prevented the authors of WHC-MR-0132 and LA-UR-97-311 from knowing that the B-200 and T-200 series tanks were actually placed in service in 1946 instead of 1952. Add - Section 4.0: Discussed Hanford Site best basis inventories (BBIs) for tank	Michael E Johnson 10/18/04 Michael E. Johnson	S Mackay 12/15/04. STEWART MACKAY

Tank Farm Contractor (TFC) RECORD OF REVISION (continued)	(1) Document Number RPP-13300		Page 2

Change Control Record			
(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Resp. Engr. (print/sign/date)	(6) Resp. Mrg. (print/sign/date)
	wastes. Indicated analyses of core samples and waste templates are the basis for the gross alpha and transuranic elements concentrations reported. Replaced the B-201 and B-202 inventories for transuranic elements with the B-200 and T-200 series tanks BBIs for transuranic elements.		

RPP-13300
Revision 1

ORIGIN OF WASTES IN THE B-200 AND T-200 SERIES SINGLE-SHELL TANKS

M. E. Johnson
CH2M HILL Hanford Group, Inc.

Date Published
October 2004

CH2MHILL
Hanford Group, Inc.

Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

Contract No. DE-AC27-99RL14047

SUMMARY

A review of historical documents was conducted to determine the origin of the wastes stored in single-shell tanks 241-B-201 through 241-B-204 and 241-T-201 through 241-T-204. This review was conducted to support disposition of the wastes in these tanks.

The wastes stored in tanks 241-B-201 through 241-B-204 and tanks 241-T-201 through 241-T-204 were determined to originate from plutonium concentration activities conducted from October 1946 through June 1952 in the 224-B and 224-T Concentration buildings. The 224-B and 224-T Concentration buildings received the plutonium nitrate solution that was separated from the irradiated reactor fuel as part of reprocessing activities conducted in the 221-B and 221-T Bismuth Phosphate plants. Tanks 241-B-201 through 241-B-204 also received miscellaneous flush solutions from deactivation activities conducted at the 221-B Bismuth Phosphate Plant and 224-B Concentration building. No other types of waste were transferred to these tanks.

CONTENTS

1.0 INTRODUCTION 1

2.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS 1
- 2.1 BISMUTH PHOSPHATE PROCESS: B- AND T-PLANTS 2
  - 2.1.1 224-B and 224-T Concentration Buildings 9

3.0 ORIGINS OF WASTE IN TANKS 241-B-201 THROUGH 241-B-204 AND 241-T-201 THROUGH 241-T-204 10
- 3.1 DESCRIPTION OF TANKS 241-B-201 THROUGH 241-B-204 AND 241-T-201 THROUGH 241-T-204 10
- 3.2 WASTE TRANSFERS INTO TANKS 241-B-201 THROUGH 241-B-204 12
- 3.3 WASTE TRANSFERS INTO TANKS 241-T-201 THROUGH 241-T-204 15
- 3.4 CURRENT REVIEW OF WASTE TRANSFER RECORDS COMPARED WITH OTHER REVIEWS 16
  - 3.4.1 B-200 Series Tanks 17
  - 3.4.2 T-200 Series Tanks 19

4.0 TRANSURANIC ANALYSES OF WASTES 21

5.0 SUMMARY 24

6.0 REFERENCES 25

APPENDICES

A WASTE STATUS SUMMARY REPORTS A-1

B WHC-MR-0132, A HISTORY OF THE 200 AREA TANK FARMS - TANKS 241-B-201 THROUGH 241-B-204 AND TANKS 241-T-201 THROUGH 241-T-204 .... B-1

LIST OF FIGURES

Figure 1 Waste Streams from Bismuth Phosphate Process 5

Figure 2 Cross Section of 200 Series Single-Shell Tank. 11

LIST OF TABLES

Table 1 Estimated Composition of Bismuth Phosphate Plant Wastes 6

Table 2 Analyses of Bismuth Phosphate Process Supernatants 7

Table 3 Radionuclide Analyses of Metal Waste and First Decontamination Cycle Waste 8

Table 4. Comparison of Metal Waste and Tanks 241-B-201 to 241-B-204 Sludges. 20

Table 5. Transuranic Element Analytical Results for Sludges 22

Table 6. Gross Alpha Analyses for Sludges. 23

LIST OF TERMS

1C	first cycle of the decontamination process
2C	second decontamination cycle wastes
Ci	Curies
CW	coating waste
kg	kilograms
ηCi/g	nanocuries per gram
MW	metal waste
NCRW	neutralized cladding waste
PAS	PUREX acidified sludge
PSN	PUREX supernate neutralized
PSS	PUREX sludge supernate
PUREX	plutonium-uranium extraction
REDOX	reduction-oxidation
RSN	REDOX supernate neutralized
TBP	tri-butyl phosphate
TIC	total inorganic carbon
TOC	total organic carbon
WSTRS	Waste Status and Transaction Record Summary
µCi/g	microcuries per gram
µg/g	micrograms per gram

1.0 INTRODUCTION

This document discusses the origins of wastes presently stored in single-shell tanks 241-B-201 through 241-B-204 and tanks 241-T-201 through 241-T-204. Section 2.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to the underground storage tanks. A basic understanding of the different types of wastes that were generated at the Hanford Site is provided for the reader to comprehend the waste types transferred to tanks 241-B-201 through 241-B-204 and tanks 241-T-201 through 241-T-204, as discussed in Section 3.0. Section 4.0 summarizes the waste types that were transferred into these tanks.

2.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There are 149 single-shell tanks and 28 double-shell underground storage tanks located at the Hanford Site. These tanks received supernatants and precipitated sludges originating from the reprocessing of spent nuclear fuels, research and development, plutonium processing, and waste management activities.

There were numerous spent nuclear fuel reprocessing, research, and development, plutonium processing, and waste management activities conducted at the Hanford Site starting in 1944. 221-T Plant (T-Plant), first used for reprocessing of spent nuclear fuel in December 1944, operated until March 1956 using the bismuth phosphate process. The 221-B Plant (B-Plant) reprocessed spent nuclear fuel from April 1945 to June 1952 using the bismuth phosphate process. The bismuth phosphate process was based on carrier precipitation batch chemistry. The plutonium product solutions from the B-Plant and T-Plant were transferred to the 224-B and 224-T buildings for concentration. B-Plant was later renovated and used from 1963 through 1986 to recover the fission products cesium and strontium from the wastes stored in single-shell tanks.

Later, B- and T-Plants were replaced by the REDOX (reduction-oxidation) and PUREX (plutonium-uranium extraction) plants using continuous solvent extraction processes for separating uranium and plutonium from dissolved, spent nuclear fuels. The REDOX plant operated from January 1952 through November 1966 and PUREX operated intermittently from January 1956 to early 1990). Uranium was recovered from the wastes stored in the single-shell tanks from operation of the bismuth phosphate plants using a tributyl phosphate solvent extraction process in the tri-butyl phosphate (TBP) Plant (221-U building). The Hot Semiworks, building 201-C, was operated from 1949 through 1967 as a research and development facility for many of the Hanford Site chemical processes (e.g., REDOX, TBP, B-Plant strontium separations, PUREX process tests). All of these facilities generated numerous sources of radioactive mixed wastes that are stored in the single-shell tanks and double-shell tanks.

In addition to the operations conducted in the processing plants, there were numerous activities conducted within the underground storage tanks, including evaporation, cesium precipitation using ferrocyanide, and discharge of supernatants to underground cribs. These spent nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities resulted in the mixing and alteration of the different waste types within several (but not all) of the 149 single-shell tanks and 28 double-shell tanks.

The spent nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted in the processing plants are described in the following sections. Refer to DOE/RL-97-02; *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February* for additional details on these processes.

As will be shown in Section 3.0, none of the spent nuclear fuel processing wastes from these operations were received into tanks 241-B-201 through 241-B-204 or 241-T-201 through 241-T-204. These tanks only received waste from the 224-B and 224-T plutonium concentration buildings. The B-200 series tanks also receive wastes from equipment cleaning. The process operations conducted in the 221-B, 224-B, 221-T and 224-T are discussed in the following subsections to provide an understanding of the waste types generated in these facilities.

2.1 BISMUTH PHOSPHATE PROCESS: B- AND T-PLANTS

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from spent nuclear fuel using the bismuth phosphate process. Figure 1 shows a summary of the 221-B and 221-T Plant bismuth phosphate process, which is referred to throughout this discussion.

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste, sometimes referred to as Coating Waste (CW), was transferred to single-shell underground storage tanks. (See item [1] in Figure 1)

Reprocessing of the spent nuclear fuel commenced with the dissolution of the uranium fuel. The fuel element uranium cores (see item [2] in Figure 1) were dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented uranium precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed three times with water to separate the acidic supernatant from the plutonium precipitate, (see item [3] in Figure 1). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90% of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium is phosphate insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as Metal Waste (MW). Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). The laboratory tests indicate the percentage of cecium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent respectively.

After separating and washing the plutonium precipitate from the metal waste, reprocessing of spent nuclear fuel was completed in the 221 Plant Bismuth Phosphate process. Plutonium decontamination was conducted in the remainder of the 221 Plant Bismuth Phosphate process. The plutonium bearing cake was dissolved in nitric acid and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products ("by-product precipitation"), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C) were combined with the coating removal waste and transferred to single-shell tanks. The 1C waste (see item [4] in Figure 1), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids from the first decontamination cycle were dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 1) was conducted to reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28). The plutonium product from the bismuth phosphate process was subsequently transferred to the 224-B or 224-T building for concentration.

Table 1 provides the estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C, and 2C that was stored in single-shell tanks are provided in Tables 2 and 3. These sample analyses support previous statements regarding the partitioning of fission products to the various Bismuth Phosphate Plant

Waste Streams. Specifically, 90% of the fission products were partitioned to the metal waste as evident by the Cs-137 concentration provided in Table 3. About 10% of the fission products partitioned to the 1C waste, as demonstrated by the gross beta and gross gamma radionuclides analyses provided in Table 2 and the Cs-137 analyses provided in Table 2. The 2C waste contained less than 0.1% of the fission products, as evident from information provided in Table 2.

Figure 1 Waste Streams from Bismuth Phosphate Process

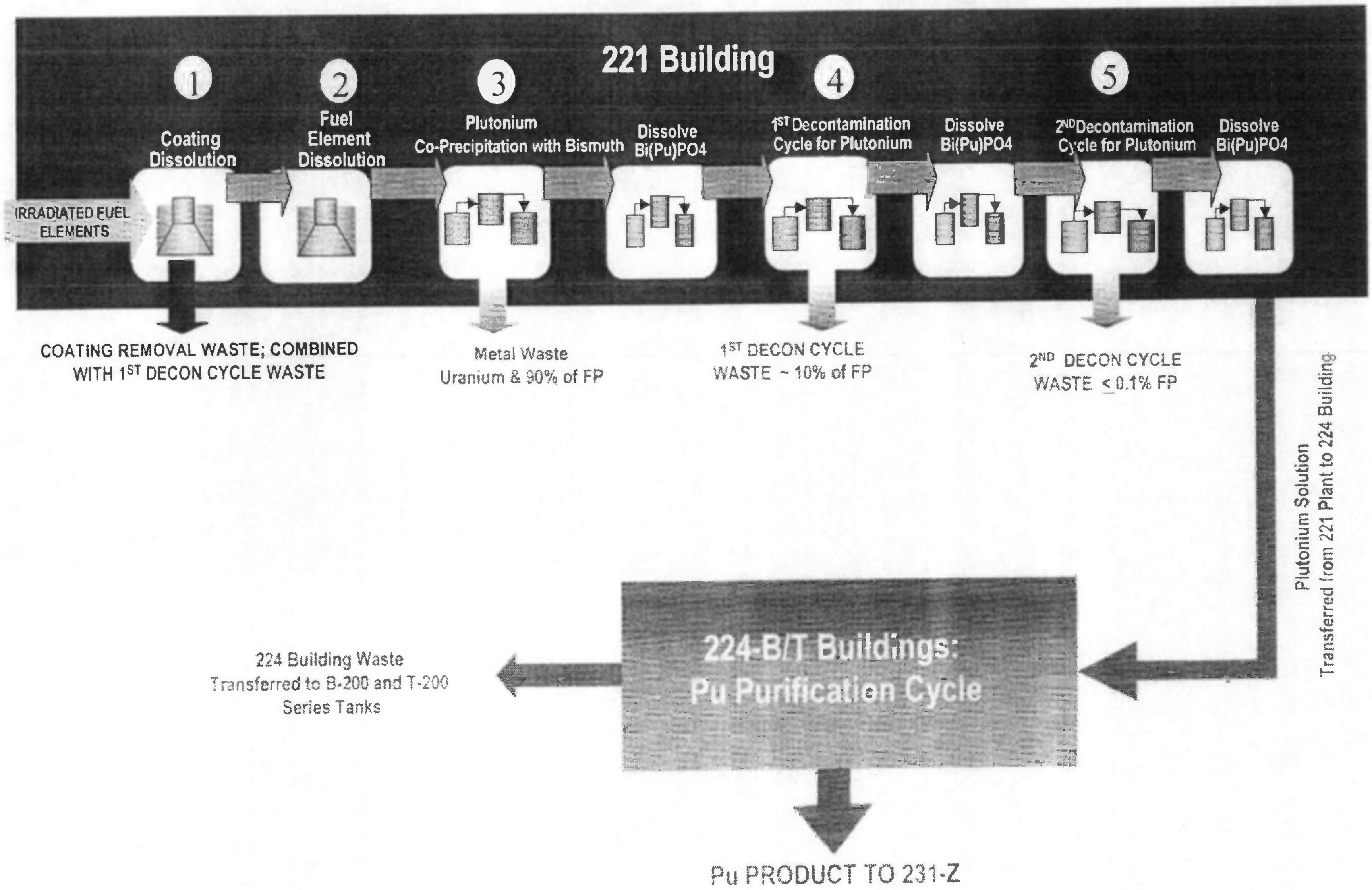


Table 1 Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet [1]

Analyte[2]	Coating Removal Waste[7]	Metal Waste[7]	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 [4]	1.6E-07 [5]	1.68E-04[6]
Uranium	0.15		0.235 [4]	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 [4]	1.13E+04 [5]	1.13E+02[6]
Sodium Aluminate ($NaAlO_2$)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate ($NaNO_3$)	61.8				
Sodium Nitrite ($NaNO_2$)	56.0				
Sodium Silicate ($NaSiO_3$)	4.3				
Uranyl nitrate (UHN) [3]		132			
Fluorine (F)					5.6
Nitrate (NO_3)		9.7	93.1	61.3	42.4
Sulfate (SO_4)		24.4	4.73	3.61	0.35
Phosphate (PO_4)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH_4)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF_6)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:
(1) See HW-23043
(2) Analyses are reported in grams per liter, except for gamma activity, which is counts/minute/mL.
(3) HW-23043 page 31 notes that uranium is not actually present in this form, but is probably as $NaUO_2PO_4$ and $Na_4(UO_2)_2CO_3$.
(4) Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043 pages 20 and 22).
(5) Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043 pages 26 and 28).
(6) Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043 pages 39, 44, 48, and 54)
(7) The coating waste batch size is based on 6,600-lbs uranium, but that the metal waste dissolution batch size is based on 2,200-lbs uranium.

Table 2 Analyses of Bismuth Phosphate Process Supernatants

Waste Type[1,2]	Tank	pH	Pu µGm/liter	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200[5]	70[5]	12-12-1946
Metal Waste	T-101	10	35	110	25	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? [3]	1.5E-03	3.0E-03	7-1-1947
Waste Type	**Tank**	**pH**	**Pu µGm/liter**	**Gross Beta Counts/minute/cc**	**Gross Gamma Counts/minute/cc**	**Date Sampled**
2C	T-110	Not reported [4]	15	4.9E+04	30	7-13-1945
2C	T-110	9.8[4]	19	6.9E+04	55	7-25-1945
2C	B-110	9.6[4]	8.5	7.0E+04	55	7-25-1945

Notes:

[1] See HW-10728 and HW-3-3220.

[2] Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.

[3] The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.

[4] Prior to October 1945, the 2C waste was neutralized to a pH of approximately 10. The waste collected in tanks 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).

[5] Reduction in the gross gamma and beta analyses for the metal waste in tank T-101 from sampling in 12-12-1946 to 07-01-1947 is due to decay of short-lived fission products.

Table 3 Radionuclide Analyses of Metal Waste and First Decontamination Cycle Waste

Tank	Date Filled	Pu μgm/cc	Gross Beta μCi/cc	Gross Gamma μCi/cc	Sr μCi/cc	Cs μCi/cc	Ru μCi/cc	Rare Earths + Y – Ce μCi/cc	Ce μCi/cc	Nb μCi/cc	Zr μCi/cc	Te μCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction [1]												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste					**0.59**	**57.3**						
Analyses of First Decontamination Cycle Waste Mixed with Coating Removal Waste Supernatant [2]												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.012	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.012		0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037		0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.005	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 [3]	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW		**7.67E-03**	**0.39**	**0.22**	**0.0058**	**0.15**						

Notes:
(1) HW-36717, Decontamination of Uranium Recovery Process Stored Wastes Interim Report, May 16, 1955, W. W. Schulz, General Electric Company, Richland Washington.
(2) HW-20195, Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants, February 5, 1951, General Electric Company, Richland Washington.
(3) Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

2.1.1 224-B and 224-T Concentration Buildings

The process steps executed in the 224 Concentration buildings were as follows (HW-10475-C, chapter VII and HW-23043, pages 34 to 55):

- The starting batch size received from the 221 Plant was 330 gallons.
- Plutonium solution from the 221 Plant was oxidized with sodium bismuthate to convert the plutonium to the +6 valence state.
- Phosphoric acid was added to produce a bismuth phosphate ($BiPO_4$) precipitate, with the plutonium still in solution. At this point, operators wanted to get rid of all the $BiPO_4$.
- The solution and precipitate were separated by centrifugation.
- Nitric acid was added to dissolve the $BiPO_4$ precipitate, with this solution removed as waste.
- Potassium permanganate ($KMnO_4$) was added to the plutonium solution to ensure all the plutonium was in the +6 valence state.
- Hydrogen fluoride and lanthanum salts were added to the plutonium solution producing a lanthanum fluoride precipitate. Fission products were carried with the lanthanum. This precipitate contained all the lanthanides (cerium, lanthanum, etc.) and residual ruthenium, samarium, europium, americium, and curium that the $BiPO_4$ could not carry out of the stream.
- The lanthanum fluoride precipitate was dissolved in nitric acid, neutralized with sodium hydroxide, and sent to waste storage tanks.
- Oxalic acid was added to the plutonium solution collected from the lanthanum fluoride precipitation step to reduce the plutonium to the +4 valence-state.
- Hydrogen fluoride and lanthanum salts were added to the plutonium solution producing a lanthanum fluoride and plutonium fluoride precipitate. The precipitate was centrifuged to collect the solids.
- Potassium hydroxide was added to convert the plutonium fluoride / lanthanum fluoride precipitate into lanthanum hydroxide and plutonium hydroxide solids.
- After centrifuging to separate the lanthanum hydroxide and plutonium hydroxide solids, these solids are reacted with nitric acid solution to dissolve the lanthanum and plutonium. The plutonium nitrate / lanthanum nitrate solution product was now ready for transfer to the 231-Z building or 234-5 building.

By this time, each original 330-gallon batch of plutonium-bearing solution that had entered the 224 buildings was concentrated down to eight gallons. The liquid waste (designated as "224") from the lanthanum fluoride and barium sulfate precipitation process was neutralized and transferred to the single-shell tanks. Table 1 provides the estimated compositions of the neutralized 224 waste solutions based on the October 1, 1951 flowsheet (HW-23043).

3.0 ORIGINS OF WASTE IN TANKS 241-B-201 THROUGH 241-B-204 AND 241-T-201 THROUGH 241-T-204

This section provides a brief description of tanks 241-B-201 through 241-B-204 and 241-T-201 through 241-T-204, and a summary of the documented waste transfers into these tanks. In order to determine the origins of the wastes presently stored in these tanks, declassified historical reports for the Hanford Site were reviewed. Documents reviewed included the Hanford site contractors' monthly reports (1945 through 1975), Army Corp of Engineers monthly reports (December 1944 through December 1946), U. S. Atomic Energy Commission monthly reports (1947 through 1954), waste disposal reports (1948 through 1975), tank farm waste status summary reports, and miscellaneous letters and technical reports. While no records were located that identify individual transfers of waste, the above cited reports do provide a compendium of information that supports the discussion of historical waste types transferred into the B-200 and T-200 series tanks.

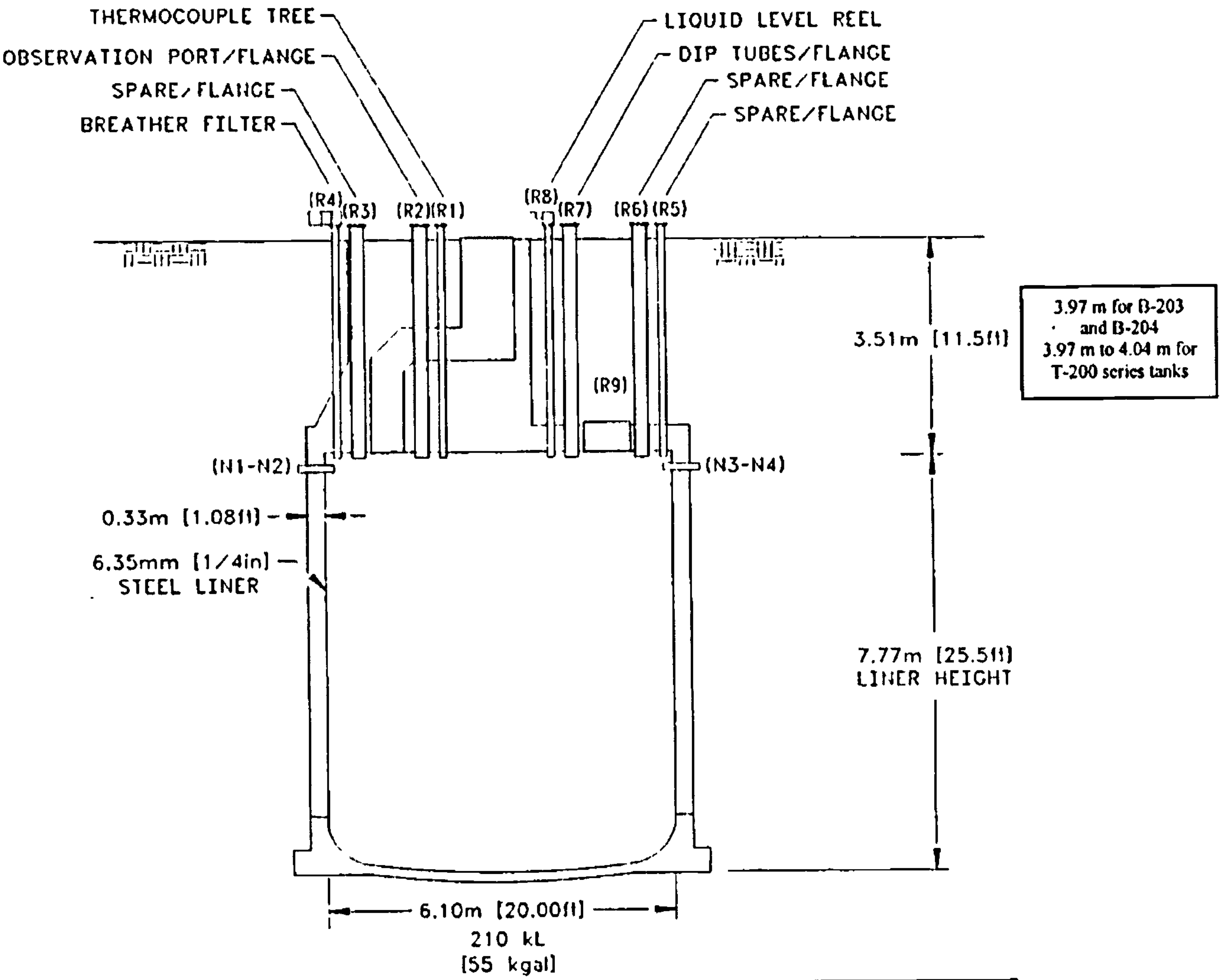
The Hanford site contractors' monthly reports for January 1945 through July 1951 list the volume of waste stored in the single-shell tanks, with the exception of the B-200 and T-200 series single-shell tanks. No records were located that provided the volume of wastes stored in the single-shell tanks from August 1951 through February 1952. Beginning in March 1952, waste transfers and the volume of waste stored in each single-shell tank were reported for each tank in a waste status summary report. Evidence of the waste types transferred to the B-200 and T-200 series single-shell tanks is provided in the Hanford site contractors' monthly reports, waste disposal reports, and miscellaneous letters and technical reports cited in the following sections.

With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at http://www2.hanford.gov/declass/. Full-text copies of the waste status summary reports cited in this section are provided in Appendix A. The results of the present review of historical records are compared with a previous review of historical report that was conducted in 1980 as part of WHC-MR-0132, *A History of the 200 Area Tank Farms*.

3.1 DESCRIPTION OF TANKS 241-B-201 THROUGH 241-B-204 AND 241-T-201 THROUGH 241-T-204

Single-shell tanks 241-B-201 through 241-B-204 (B-200 series) and tanks 241-T-201 through 2410T-204 (T-200 series) were originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX). The B-200 and T-200 series tanks are twenty-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides, as depicted in Figure 2. Each tank has a design capacity of 55,000 gallons at a liquid depth of twenty-four feet. The 200 series tanks are grouped together with twelve larger capacity single-shell tanks (100 series) to comprise a tank farm.

Figure 2 Cross Section of 200 Series Single-Shell Tank.



3.2 WASTE TRANSFERS INTO TANKS 241-B-201 THROUGH 241-B-204

This section discusses the date and source of wastes that were transferred into tanks 241-B-201 through 241-B-204. Tanks 241-B-201 through 241-B-204 did not receive any high-level wastes. These tanks received transuranic waste from operations conducted at the 224-B plutonium concentration building and equipment decontamination waste. According to the *Hanford Technical Manual Section C* for the bismuth phosphate process (HW-10475-C, pages 909 - 911), the metal waste solution from the bismuth phosphate processing plant (B-Plant) was originally planned to be decontaminated to separate fission products from the uranium using scavenger precipitation processes. This decontamination process was to be conducted in B-Plant with the precipitates being transferred to the 241-B-201 through 241-B-204 tanks. However, the metal waste decontamination process was never implemented and metal waste solution was *not* transferred into these tanks. Tanks 241-B-201 through 241-B-204 were unused until October 1, 1946.

Beginning in October 1946, tanks 241-B-201 through 241-B-204 were used as settling tanks for the solids that were contained in the 224-B Concentration building waste, with the liquid waste discharged to the 241-B-1 and 241-B-2 cribs. Prior to October 1946, the waste from the 224-B Concentration building was transferred to the 361-B settling tank and the liquid portion discharged to the 241-B-361, reverse-well. By September 1946, solids had accumulated in the 361-B settling tank to a point where the tank had reached its storage capacity, causing shutdown of 221-B and 224-B building operations, as reported in the Army Corp of Engineers monthly report for September 1946 (HAN-45800, page 77). A project was initiated in August 1946 to divert the 224-B Concentration building waste to tank 241-B-201 (HW-7-4640). The Army Corp of Engineers monthly report for October 1946 reports this project was completed on October 1, 1946, at which time a connection was made from the 224-B building waste transfer line to tank 241-B-201 (HAN-45800, page 87). A similar connection was also completed on October 14, 1946 from the 224-T Concentration building waste transfer line to tank 241-T-201. The *Hanford Engineering Works Monthly Report for October 1946* (HW-7-5362-DEL, pages 27 and 28) confirms that the 224-B building waste was routed to tank 241-B-201 in October 1946.

Tank 241-B-201 received waste from the 224-B Concentration building from October 2, 1946 through October 1948, after which the tank was considered filled with solids and the 224-B Concentration building waste was diverted to tank 241-B-204 (HW-11499, page 34). Tank 241-B-204 was connected in a cascade with tanks 241-B-203 and 241-B-202 (HW-10714-DEL, page 31). Liquid was gravity discharged from the last tank in the cascade, 241-B-202 to the 241-B-1 and 241-B-2 cribs. Solids contained in the 224-B building waste were allowed to settle in tanks 241-B-204 through 241-B-202. The cascade of tanks 241-B-204, 241-B-203, and 241-B-202 continued to receive 224-B Concentration building wastes until September 1952. The discharge of 224-B Concentration building waste from the B-202 tank to the 241-B-1 and 241-B-2 cribs is documented in HW-20583, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, HW-25301, *Process Waste Disposal Summary – 200 Areas January 1952 through June 1952*, HW-28121, *Release of Radioactive Wastes to Ground*, and HW-33591, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*.

In addition to waste from the 224-B Concentration building, tanks 241-B-202 through 241-B-204 also received low-activity waste from tank 5-6 in 221-B Plant from October 3, 1947 through August 12, 1948 (HW-17088, page 31 and HW-38562, page 9). Tank 5-6 received low activity cell drainage as well as scrubber solution from the dissolvers in 221-B Plant (HW-10728, page 2). Tanks 241-B-201 through 241-B-204 were reported to have received a total of 22,300,000 liters of waste containing 2180 grams of plutonium and 4000 curies of fission products from May 1947 through January 1, 1950 (HW-17088, page 57). Approximately 7,400,000 liters of the waste transferred to tank 241-B-201 was low-activity waste from tank 5-6 in 221-B Plant (HW-17088, page 57). The low concentration of fission products in the 224 building and tank 5-6 waste, ~180 micro-curies per liter supports that no high-level waste was transferred along with the tank 5-6 waste to tanks 241-B-201 through 241-B-204.

In July 1952, B-Plant and the 224-B Concentration building were shut down because their processing capability was no longer needed and had been replaced by the 202-S REDOX facility. Beginning in July 1952, cleanout of B-Plant and the 224-B Concentration building was initiated, with the spent nuclear fuel dissolver heels removed from equipment in the 221-B building (HW-25227-DEL, pages Ed-1 and Ed-6). The dissolvers, metal waste equipment and other process equipment in the 221-B Plant were flushed with nitric acid solution from July 1952 through September 1952 to remove fission products and plutonium. The recovered plutonium solutions were processed through the normal bismuth phosphate flowsheet and wastes transferred to their normal disposal pathways (HW-25227-DEL page Ed-1 and Ed-6, HW-25533-DEL, pages Ed-1 and Ed-6, HW-25781-DEL, page Ed-1, and HW-26047-DEL, pages Ed-1 and Ed-5). Plutonium solutions derived from equipment cleanout activities in the 221-B Plant were processed in the 224-B Concentration building to recover the plutonium, with waste from the 224-B Concentration building transferred to the cascade of tanks 241-B-204, 241-B-203, and 241-B-202.

The waste solutions generated from nitric acid flushing of the 221-B Plant equipment were transferred to their normal disposal pathways. The B-200 series single-shell tanks only received waste from the 224-B Concentration building during the nitric acid flushing of the 221-B Plant equipment. Monthly reports for the 200 Area tank farms for April 1952 through September 1952 (HW-27838 and HW-27839) substantiate that only 224-B Concentration building waste was discharged to the cascade of tanks 241-B-204, 241-B-203, and 241-B-202 during the nitric acid flushing of 221-B Plant equipment.

High-level waste was removed from affected 221-B Plant equipment as a result of removing the heels from the dissolvers and nitric acid flushing of the equipment. Additional cleaning of the internal surfaces of piping and equipment in 221-B Plant and 224-B building was conducted using various chemical solutions and water, as described in HW-27774. This cleaning occurred from October 1952 through March 1953.

Flushes of metal waste, first decontamination cycle, and second decontamination cycle equipment were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, as documented in waste status summary reports for the 200 Area tanks farms for this period (HW-27840, HW-27841, HW-27842, and HW-27775). In November 1952, the cascade of tanks 241-B-204, 241-B-203, and 241-B-202 received flushes of 224-B building equipment and metal waste lines (HW-27840, page 20). In December 1952, they received flushes of 224-B building equipment and 221-B Plant section 9 metal waste tanks (HW-27840, page 28). In January, February and March 1953 they received flushes of 224-B building equipment and 221-B Plant sections 7 and 8 extraction equipment (HW-27841, page 9, HW-27842, page 9, HW-27775, page 9). As previously discussed, the dissolvers, metal waste equipment and other equipment in the 221-B Plant had been flushed with nitric acid from July through September 1952 and removed the high level waste from affected equipment. Therefore, the 221-B Plant equipment flushing conducted from October 1952 through March 1953 did not generated high-level waste.

Flushing of the B-Plant cells and wetting of process equipment with water was conducted in April 1953 through June 1, 1953 (HW-27932-DEL, page Ed-5; HW-28267-DEL, page Ed-5; and HW-28576-DEL, page Ed-5). These flush solutions were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, as documented in waste status summary reports for the 200 Area tanks farms for this period (HW-28043, HW-28377, and HW-28712). Additional decontamination of equipment in the 224-B Concentration building was also conducted in May through July 1953 with the flush solutions processed through T-Plant to recover plutonium (HW-28267-DEL, page Ed-5, HW-28576-DEL, page Ed-5, and HW-28906-DEL, page Ed-5).

In October 1954, approximately 50,000-gallons of water were transferred from the 221-B Plant through the cascade of tanks 241-B-201 through 241-B-204 (HW-33544, page 4 and HW-38562, page 9). In December 1954, tank 5-6 (low activity cell drainage in 221-B Plant) was reported as being routed to the cascade of tanks 241-B-204, 241-B-203, and 241-B-202, but no volume of waste was reported as being discharged to these tanks in the tank farm monthly waste status summary report (HW-34412, page 4). However, the June 1955 report for discharge of wastes to the ground (HW-38562, page 9) indicates approximately 750,000 liters (~198,000 gallons) of low-activity waste were discharged from 221-B Plant tank 5-6 from December 1954 through June 1955 to tanks 241-B-202 through 241-B-204 to the 241-B-1 and 241-B-2 cribs.

In July 1955, 224-B Concentration building flush water was reported as being routed to the cascade of tanks 241-B-204, 241-B-203, and 241-B-202, but no volume of waste was reported as being discharged to these tanks in the tank farm monthly waste status summary report (HW-38401, page 4). However, the June 1956 report for discharge of wastes to the ground (HW-44784, page 27) indicates approximately 653,000 liters (~172,500 gallons) of low-activity waste were discharged from 221-B Plant tank 5-6 from July 1955 through September 1955 to tanks 241-B-202 through 241-B-204 to the 241-B-1 and 241-B-2 cribs. Beginning in October 1955, the low activity waste from 221-B Plant tank 5-6 was routed to the cascade of tanks 241-B-110, 241-B-111 and 241-B-112 and then to the 241-B-1 and 241-B-2 cribs (HW-44784, page 27).

During the period of 1954 through 1955, the 221-B Plant and 224-B Concentration building were being modified for restart as part of the so-called "4X Program" (HW-33903). The 4X Program was a program to operate all four separation facilities (221-B, 221-T, 202-S REDOX and 202-A PUREX Plants) simultaneously. The modifications conducted in the 221-B Plant and 224-B Concentration building resulted in the transfer of low-activity waste to tanks 241-B-202 through 241-B-204. However, the 4X Program was cancelled in March 1957 and the 221-B Separations Plant and 224-B Concentration building were placed in lay-away status (DDTS-Generated-491, "Lay-Away of the Bismuth Phosphate – TBP Plants and the Metal Waste Removal Facilities").

From 1957 through 1963, the 221-B Plant was converted for separating fission products of cesium-137 and strontium-90 from PUREX plant wastes. A flush of 7,500-gallons was transferred from the 221-B Plant to the cascade of tanks 241-B-204, 241-B-203, and 241-B-202 sometime January 1, 1962 through June 30, 1962 (HW-74647, page 4). This is the last transfer of any waste solutions into tanks 241-B-201 through 241-B-204. The 221-B Plant did not receive any waste for fission product separation until August 2, 1963 (HW-78817, page 5) and did not discharge fission product waste to tanks 241-B-201 through 241-B-204.

Tanks 241-B-201 through 241-B-204 did not receive any liquid wastes originating from the operation of the first cycle solvent extraction system, or equivalent, or the concentrated wastes from subsequent extraction cycles, or equivalent, in a spent fuel reprocessing facility. Rather, the wastes received into tanks 241-B-201 through 241-B-204 were from a *plutonium concentration* process (not a subsequent *extraction* process) performed in a *separate* facility and wastes from equipment decontamination activities conducted in the 221-B Bismuth Phosphate Plant and 224-B Concentration building.

3.3 WASTE TRANSFERS INTO TANKS 241-T-201 THROUGH 241-T-204

This section discusses the date and source of wastes that were transferred into tanks 241-T-201 through 241-T204. These tanks did not receive any high-level waste but did receive transuranic waste from operations conducted at the 224-T plutonium concentration building. According to the *Hanford Technical Manual Section C* for the bismuth phosphate process (HW-10475-C, chapter X, pages 909 - 911) the metal waste solution from T-Plant was originally planned to be decontaminated to separate fission products from the uranium using scavenger precipitation processes. This decontamination process was to be conducted in T-Plant with the precipitates being transferred to the 241-T-201 through 241-T-204 tanks. However, the metal waste decontamination process was never implemented and metal waste solution was *not* transferred into these tanks. Tanks 241-T-201 through 241-T-204 were unused until November 4, 1946.

Beginning on November 4, 1946, tank 241-T-201 was used as a settling tank for the solids that were contained in the 224-T Concentration building waste, with the liquid discharged to the 241-T-1 and 241-T-2 cribs (HW-33591, page 4). The waste from the 224-T Concentration building had been previously transferred to the 361-T settling tank and the liquid portion discharged to the 241-T-361, reverse-well. By July 1946, solids had accumulated in the 361-T, settling tank to a point where the tank had reached its storage capacity (HAN-45800, page 67). A project was initiated in August 1946 to divert the 224-T Concentration building waste to tank 241-T-201 (HW-7-4640). The Army Corp of Engineers monthly report for October 1946 reports this project was completed on October 14, 1946, at which time a connection was made from the 224-T building waste transfer line to tank 241-T-201 (HAN-45800, page 87). The Hanford Engineering Works monthly report for October 1946 (HW-7-5362-DEL, page 27 to 28) confirms that a route was established for transfer of the 224-T building waste to tank 241-T-201 in October 1946, with waste transfer initiated on November 4, 1946.

Tank 241-T-201 received waste from the 224-T Concentration building from November 4, 1946 through May 24, 1949, after which the tank was considered filled with solids and the 224-T Concentration building waste was routed to tank 241-T-204 (HW-13561-DEL, page 41). The solids depth in tank 241-T-201 was reported as "twenty feet of rather compact sludge and approximately three feet of a light sludge" (HW-13561-DEL, page 41).

Tank 241-T-204 was connected in a cascade with tanks 241-T-203 and 241-T-202, (HW-10714-DEL, page 31). Liquid was gravity discharged from the last tank in the cascade, tank 241-T-202, to the 241-T-1 and 241-T-2 cribs. Solids contained in the 224-T Concentration building waste were allowed to settle in tanks 241-T-204 through 241-T-202.

The tanks 241-T-204, 241-T-203, and 241-T-202 cascade continued to receive 224-T Concentration building wastes until May 29, 1952, after which this waste was transferred to the cascade of single-shell tanks 241-T-110, 241-T-111, and 241-T-112 (HW-27838, page 17). Tanks 241-T-201 through 241-T-204 were considered filled with solids and taken out of service effect on May 29, 1952 (HW-27838, page 12).

Tanks 241-T-201 through 241-T-204 did not receive any liquid wastes originating from the operation of the first cycle solvent extraction system, or equivalent, or the concentrated wastes from subsequent extraction cycles, or equivalent, in a spent fuel reprocessing facility. Rather, the wastes are either from a *plutonium concentration* process (not a subsequent *extraction* process) performed in a *separate* facility (224-T Concentration building).

3.4 CURRENT REVIEW OF WASTE TRANSFER RECORDS COMPARED WITH OTHER REVIEWS

Historical records of waste transfers into, from and among the 200 Area tank farms were compiled and reported in WHC-MR-0132, LA-UR-96-3860, and LA-UR-97-311. Additional waste transfer records have been summarized for the B-200 series tanks in WHC-SD-WM-ER-310. These documents were reviewed and compared with the current analysis documented in this report to determine if significant discrepancies exist.

3.4.1 B-200 Series Tanks

These previous reviews to determine the tank contents for tanks 241-B-201 through 241-B-204 generally refer to WHC-MR-0132 and provide no new references regarding waste transfers into these tanks. Therefore, the current review of waste transfer records for tanks 241-B-201 through 241-B-204 was compared to that of WHC-MR-0132. Appendix B provides copies of the tabulated waste transfer records for tanks 241-B-201 through 241-B-204 from WHC-MR-0132.

In general, the waste transfer records summarized in WHC-MR-0132 are consistent with the information present in this document. However, there are three significant discrepancies that are discussed in the following sections.

3.4.1.1 Date Tanks Used to Receive Waste

The waste transfer records summarized in WHC-MR-0132 for tanks 241-B-201 through 241-B-204 do not indicate the presence of any waste in tanks 241-B-201 through 241-B-204 until the first quarter of 1952. This is inconsistent with historical documents discussed in this document, which indicates that these tanks received waste from the 224-B Concentration building beginning in October 1946. The Hanford site contractors' monthly reports for January 1945 through July 1951 list the volume of waste stored in the single-shell tanks, with the exception of the B-200 and T-200 series single-shell tanks. Evidence of the waste types transferred to the B-200 and T-200 series single-shell tanks is provided in the Hanford site contractors' monthly reports, waste disposal reports, and miscellaneous letters and technical reports cited in the following sections. These documents were classified until the early 1990's, which would have limited their availability. It is likely that these documents were unavailable to the authors of WHC-MR-0132 and LA-UR-97-311.

3.4.1.2 Cascade Operation of Tanks

Beginning in the first quarter of 1952, WHC-MR-0132 indicates that 224-B Concentration building waste (designated as "224") was transferred into tanks 241-B-201 through 241-B-204, which were operated as a cascade to a crib. However, this contradicts information published in HW-33591(*Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*), which states that tank 241-B-201 received waste from the 224-B Concentration building only from October 2, 1946 through October 1948, after which the tank was considered filled with solids and the 224-B Concentration building waste was diverted to tank 241-B-204.

Tank 241-B-204 was connected in a cascade with tanks 241-B-203 and 241-B-202. Liquid was gravity discharged from the last tank in the cascade, tank 241-B-202, to the 241-B-1 and 241-B-2 cribs. Furthermore, tank farm waste status summary records for April through June 1952 (HW-27838) and July through September 1952 (HW-27839) indicate that only tanks 241-B-204 through 241-B-202 were active in a cascade with discharge to the crib. Again, this inconsistency in records does not affect the classification of the wastes in tanks 241-B-201 through 241-B-204.

3.4.1.3 Metal Waste Not Transferred to Tanks

WHC-MR-0132 identifies that metal waste (designated as "MW") was transferred into tanks 241-B-201 through 241-B-204 in the fourth quarter of 1952. WHC-MR-0132 indicates that metal waste was present in tanks 241-B-201 through 241-B-204 through the third quarter of 1953, after which time WHC-MR-0132 indicates that only "224" waste is present in these tanks. There is no explanation provided in WHC-MR-0132 to indicate that metal waste was removed from these tanks or that the earlier designation of metal waste being present in these tanks was incorrect.

It is highly unlikely that metal waste was transferred into tanks 241-B-201 through 241-B-204, since these tanks were active as a cascade that overflowed to the ground via a crib. Metal waste was not discharged to the ground because of the concentration of fission products and the economic value of the uranium. Because of the economic value of uranium, metal waste was kept segregated from other wastes. Document HW-33591 (*Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*) does not indicate the disposal of any metal waste to these tanks or the ground (i.e. cribs).

Process records for waste transfers to the 200 Area tank farms indicate that metal waste generated from spent nuclear fuel reprocessing at 221-B Plant was transferred to tank 241-BY-112 in BY Tank Farm for the period of April 1952 through September 1952 (HW-27838, pages 9, 21, and 32 and HW-27839, pages 10, 21, 32). These same historical records indicate that only flushes of the metal waste lines and 221-B and 224-B building equipment were transferred to the cascade of tanks 241-B-204 through 241-B-202 during October 1952 through March 1953. Based on this information, WHC-MR-0132 incorrectly stated the presence of metal waste in tanks 241-B-201 through 241-B-204.

Further evidence that metal waste was not transferred into tanks 241-B-201 through 241-B-204 is provided by the analyzed composition of the sludges presently stored in these tanks, as reported in the Tank Waste Information Network (http://twins.pnl.gov/twins.htm). Key analytes present in the wastes stored in tanks 241-B-201 through 241-B-204 are summarized in Tables 4.

The inventory of key analytes (e.g., Pu-239, Cl, Fe, Na, NO_3, PO_4, SO_4, CO_3, and U) in the sludge phase of tanks 241-B-201 through 241-B-204 has been divided by the mass of the sludge in each tank and reported in the upper half of Table 4. The composition of metal waste that was contained in single-shell tanks 241-T-101, 241-U-101 and 241-U-102 is provided in the lower half of Table 4. It is evident from the analyses in Table 4 that the concentrations of Pu-239, Cl, and Fe in the sludges present in tanks 241-B-201 through 241-B-204 are one order of magnitude higher than the metal waste sludges. Also, the concentration of uranium in the sludges present in tanks 241-B-201 through 241-B-204 is three orders of magnitude lower than the metal waste sludges. This comparison clearly shows that metal waste sludge contained a higher uranium concentration and a lower plutonium concentration than the sludges present in tanks 241-B-201 to 241-B-204. The sludges present in tanks 241-B-201 to 241-B-204 do not have the characteristics of metal waste sludge. Furthermore, the concentrations of cesium-137 and strontium-90 sludge present in tanks 241-B-201 through 241-B204 are less than 2E-04 Ci/l and 4E-03 Ci/l, respectively. Metal waste or other high-level waste would have cesium-137 and strontium-90 concentration several orders of magnitude higher, as reported in Table 3.

3.4.2 T-200 Series Tanks

In general, the waste transfer records summarized in WHC-MR-0132 are consistent with the information present in this document. The waste transfer records summarized in WHC-MR-0132 (see Appendix B) and the Waste Status and Transaction Record Summary (LA-UR-97-311) report for tanks 241-T-201 through 241-T-204 do not indicate the presence of any waste in these tanks until the first quarter of 1952. This is inconsistent with historical documents discussed in the previous section, which indicate that these tanks received waste from the 224-T Concentration building beginning in November 1946. The Hanford site contractors' monthly reports for January 1945 through July 1951 list the volume of waste stored in the single-shell tanks, with the exception of the B-200 and T-200 series single-shell tanks. Evidence of the waste types transferred to the B-200 and T-200 series single-shell tanks is provided in the Hanford site contractors' monthly reports, waste disposal reports, and miscellaneous letters and technical reports cited in the following sections. These documents were classified until the early 1990's, which would have limited their availability. It is likely that these documents were unavailable to the authors of WHC-MR-0132 and LA-UR-97-311.

WHC-MR-0132 and LA-UR-97-311 both indicate that only 224-T building waste was received in these tanks and that these four tanks were removed from service in May 29, 1952. This is consistent with the current review of waste transfer records for these tanks.

Table 4. Comparison of Metal Waste and Tanks 241-B-201 to 241-B-204 Sludges.

	Pu-239	Cl	Fe	Na	NO_3	PO_4	SO_4	CO_3	U Total	Sample Event Description	Reference
	µCi/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g		3
241-B-201	7.51E-01	1.68E+03	1.15E+04	3.42E+04	5.05E+04	1.45E+04	3.48E+02	1.61E+04	1.56E+02	Composite analysis of core sample	3
241-B-202	1.28E-01	8.64E+02	1.19E+04	3.93E+04	6.15E+04	1.12E+04	9.81E+03	9.81E+03	3.23E+02	Composite analysis of core sample	3
241-B-203	1.94E-01	8.39E+02	3.30E+03	2.89E+04	6.22E+04	6.65E+03	2.67E+02	3.34E+03	1.78E+02	Composite analysis of core sample	3
241-B-204	2.39E-01	6.46E+02	3.72E+03	2.63E+04	4.94E+04	7.06E+03	2.81E+02	6.73E+03	1.61E+02	Composite analysis of core sample	3
Metal Waste Sample Analyses											
U-101 (S1)	5.75E-02	5.00E+02	3.80E+02	1.18E+05		5.30E+04	1.10E+03	1.57E+05	2.88E+05	Near tank inlet, near top of sludge	1
U-101 (S2)	2.91E-02	7.00E+01	1.00E+02			3.30E+04	4.10E+03	2.08E+05	3.63E+05	Near tank outlet, 1-ft from bottom	1
T-101 (a)				1.16E+05	5.10E+04	1.11E+05	2.40E+04	3.00E+03	1.12E+05	6/1948, Near tank inlet, depth unknown	2
T-101 (b)				8.50E+04	1.60E+04	1.34E+05	2.20E+04	1.00E+03	1.34E+05	8/1948, Near tank inlet, depth unknown	2
T-101 (2)				1.04E+05		1.28E+05	1.90E+04	1.58E+04	1.62E+05	11/1948, Near tank inlet, 3-ft from bottom	2
T-101 (3)				1.16E+05		1.02E+05	1.20E+04	2.56E+04	2.04E+05	11/1948, Near tank inlet, 2-ft from bottom	2
T-101 (4)				1.37E+05		4.80E+04	8.00E+03	1.15E+05	3.63E+05	11/1948, Near tank inlet, 1-ft from bottom	2
T-101 (5)				1.51E+05		1.60E+04	8.00E+03	2.55E+05	3.46E+05	11/1948, Near tank outlet, 1-ft from bottom	2
T-101 (6)				1.46E+05		1.50E+04	6.00E+03	2.63E+05	3.65E+05	11/1948, Near tank outlet, just off bottom	2
U-101 (13)	2.70E-02			1.27E+05	2.00E+03	6.10E+04	2.80E+03	1.81E+05	3.29E+05	2/1949, Near tank inlet, 4-ft from bottom	2
U-101 (14)	1.29E-02			9.40E+04	3.00E+03	4.90E+04	2.05E+03	1.66E+05	2.63E+05	2/1949, Near tank inlet, 3-ft from bottom	2
U-101 (15)	2.11E-02			1.23E+05	3.50E+03	5.30E+04	2.54E+03	1.62E+05	2.73E+05	2/1949, Near tank inlet, 2-ft, 7-inches from bottom	2
U-101 (16)	2.59E-02			1.08E+05	2.00E+03	5.20E+04	3.03E+03	4.10E+04	2.66E+05	2/1949, Near tank outlet, 3-ft from bottom	2
U-102 (17)	1.83E-02			1.09E+05	3.00E+03	1.36E+05	5.08E+03	6.90E+04	1.06E+05	2/1949, Near tank inlet, 1-inch from bottom	2
U-102 (18)	6.61E-03			8.50E+04	2.00E+03	1.05E+05	9.26E+03	9.00E+04	1.52E+05	2/1949, Near tank outlet, 1-inch from bottom	2

Notes:

Ref. 1: HW-18492, *Settling and Dissolution Characteristics and Composition of Hanford Waste Metal Sludge.*
Ref. 2: Letter HW-14157, "Compilation of Data on Composition of Bismuth Phosphate Process Metal Wastes."
Ref. 3: Best Basis Inventory obtained from the Tank Waste Information System on October 7, 2002. Sechttp://twins.pnl.gov/twins.htm

4.0 TRANSURANIC ANALYSES OF WASTES

The Hanford Site prepares a Best Basis Inventory (BBI) estimate of the composition of the wastes stored in all 177 Hanford Site underground storage tanks. The BBI effort involves developing and maintaining waste tank inventories comprising 25 chemical and 46 radionuclide components in the 177 Hanford Site underground storage tanks. Waste sample analyses, process knowledge, and waste templates are used to create the BBIs. These BBIs provide waste composition data necessary as part of the River Protection Project (RPP) process flowsheet modeling work, safety analyses, risk assessments, and system design for retrieval, treatment, and disposal operations. Development and maintenance of the BBI is an on-going effort, with the current BBIs available electronically through TWINS, http://twins.pnl.gov/data/datamenu.htm.

The BBIs for the wastes contained in tanks 241-B-201 through 241-B-204 and 241-T-201 through 241-T-204 are based on analyses of core samples and templates. Template values were used for constituents below the detection limits for sample data or constituents not measured from the sampling event. Templates are based on sampling data from tanks that contain the same waste type, supplemented with Revision 5 of the HDW model data (RPP-19822). Table 5 provides the best basis inventory concentration estimate for Np^{237}, Pu^{238}, Pu^{239}, Pu^{240}, and Am^{241} in the sludges stored in these tanks. These five radionuclides comprise the majority of the transuranic elements with half-lives greater than 20-years present in these wastes. In general, the concentrations of Np^{237}, Pu^{238}, Pu^{239} and Pu^{240}, in the sludges stored in tanks 241-B-203, 241-B-204 and 241-T-201 through 241-T-204 are calculated from the analyzed total alpha concentrations for these wastes using an alpha isotope distribution template.

Core samples of the wastes in tanks 241-B-201 and 241-B-202 were obtained in 1991. Core samples of the wastes in tanks 241-B-203 and 241-B-204 were obtained in 1995. Core samples of the wastes in tanks 241-T-201 through 241-T-204 were obtained in 1997. The sludges collected in these core samples were analyzed to determine the composition of these wastes as well as the concentration of alpha emitting radionuclides (gross alpha analysis).

The analyzed, mean gross alpha analyses, 95% lower confidence limit and 95% upper confidence limit for the wastes in tanks 241-B-201 through 241-B-204 and tanks 241-T-201 through 241-T-204 are provided in Table 6 (Wilmarth 2002). Uranium-238, which is not a transuranic element, would be included in the gross alpha analysis. The gross alpha analysis would tend to over estimate the sum of the concentrations of alpha-emitting transuranic isotopes with half-life greater than 20 years. This is substantiated by the analyses of the core samples from tank 241-B-201 and 241-B-202, which were also analyzed to determine the concentrations of Pu^{238}, Pu^{239}, Pu^{240}, and Am^{241} in these sludges (see Table 5). The sums of the concentrations of alpha-emitting transuranic isotopes with half-life greater than 20 years are ~829ηCi/g and ~218ηCi/g, respectively for tanks 241-B-201 and 241-B-202.

The analyzed gross alpha analyses for the waste in each tank are in excess of 100ηCi/g. The sum of the concentrations of Np^{237}, Pu^{238}, Pu^{239}, Pu^{240}, and Am^{241} for the sludges in tanks 241-B-201 and 241-B-202 also indicate that the concentration of transuranic elements with half-life greater than 20-years is also in excess of 100ηCi/g.

Table 5. Transuranic Element Analytical Results for Sludges

Tank Name	Analyte	Basis	Concentration, µCi/g
241-B-201	237Np	TE	1.45E-07
241-B-201	238Pu	S	6.29E-03
241-B-201	239Pu	S	7.51E-01
241-B-201	240Pu	S	4.32E-02
241-B-201	241Am	S	2.84E-02
241-B-202	237Np	TE	2.26E-07
241-B-202	238Pu	S	2.03E-03
241-B-202	239Pu	S	1.28E-01
241-B-202	240Pu	S	2.17E-02
241-B-202	241Am	S	6.67E-02
241-B-203	237Np	S	8.17E-07
241-B-203	238Pu	C	2.02E-03
241-B-203	239Pu	C	2.34E-01
241-B-203	240Pu	C	2.94E-02
241-B-203	241Am	S	3.46E-02
241-B-204	237Np	TE	2.08E-07
241-B-204	238Pu	C	1.72E-03
241-B-204	239Pu	C	1.99E-01
241-B-204	240Pu	C	2.51E-02
241-B-204	241Am	C	3.84E-02
241-T-201	237Np	TE	1.37E-07
241-T-201	238Pu	C	2.26E-03
241-T-201	239Pu	C	6.69E-01
241-T-201	240Pu	C	4.51E-02
241-T-201	241Am	C	3.96E-02
241-T-202	237Np	TE	2.20E-07
241-T-202	238Pu	C	1.45E-03
241-T-202	239Pu	C	1.67E-01
241-T-202	240Pu	C	2.11E-02
241-T-202	241Am	C	3.23E-02
241-T-203	237Np	S	6.20E-07
241-T-203	238Pu	C	1.73E-03
241-T-203	239Pu	C	2.00E-01
241-T-203	240Pu	C	2.53E-02
241-T-203	241Am	S	3.36E-02
241-T-204	237Np	S	5.35E-07
241-T-204	238Pu	C	1.46E-03
241-T-204	239Pu	C	1.68E-01
241-T-204	240Pu	C	2.12E-02
241-T-204	241Am	S	2.01E-02

Notes: Radionuclides are decay corrected to January 1, 2004
S – Sample based
C – Calculated
TE – Based on a Hanford Defined Waste model or engineering based waste template

Table 6. Gross Alpha Analyses for Sludges.				
Tank	**Mean (ηCi/g)**	**Relative Standard Deviation**	**95% Low Confidence Limit**	**95% Upper Confidence Limit**
B-201	1,310	13%	1,030	1,590
B-202	398	9%	338	457
B-203	215	9%	184	245
B-204	265	9%	226	303
T-201	757	21%	490	1,024
T-202	223	12%	180	265
T-203	196	12%	157	234
T-204	144	10%	120	169

5.0 SUMMARY

Tanks 241-B-201 through 241-B-204 received waste from the plutonium concentration activities conducted from October 1946 through June 1952 in the 224-B Concentration building. Following cessation of spent nuclear fuel processing activities in the 221-B Bismuth Phosphate Plant and cleanout of the plant inventory, tanks 241-B-201 through 241-B-204 received flush solutions from equipment cleanout in the 221-B and 224-B buildings and metal waste transfer lines.

Tanks 241-T-201 received waste from plutonium concentration activities conducted from November 4, 1946 through May 24, 1949 in the 224-T Concentration building. Tanks 241-T-202 through 241-T-204 received wastes from plutonium concentration activities conducted from May 24, 1949 through May 29, 1952 in the 224-T Concentration building.

6.0 REFERENCES

7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model," (internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group Inc., Richland, Washington.

DDTS-Generated-491, 1957, "Lay-Away of the Bismuth Phosphate – TBP Plants and the Metal Waste Removal Facilities," (letter from A. T. Gifford, Director of Operations Division, to W. K. MacCready, General Manager Chemical Processing Department, General Electric Company Hanford Atomic Products Operation, March 28), Atomic Energy Commission, Richland, Washington.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doe/culres/mpd/toc.htm, U. S. Department of Energy Richland Operations Office, Richland, Washington.

HAN-45800, 1946, *200 Area Monthly Production Reports for December 1944 through December 1946*, Army Corp of Engineers, Hanford Engineering Works, Richland, Washington.

HW-10475-C, 1944, *Hanford Technical Manual Section C*, General Electric Hanford Atomic Products Operation, Richland, Washington.

HW-10714-DEL, 1948, *Hanford Works Monthly Report for July 1948*, General Electric Company, Richland, Washington.

HW-10728, 1948, *Process Waste Data – 200 Areas*, Letter from R. S. Bell to file dated August 12, 1948, General Electric Company, Richland Washington

HW-11499, 1948, *Hanford Works Monthly Report for October 1948*, General Electric Company, Richland, Washington.

HW-13561-DEL, 1949, *Hanford Works Monthly Report for May 1949*, General Electric Company, Richland, Washington.

HW-14157, 1949, "Compilation of Data on Composition of Bismuth Phosphate Process Metal Wastes," (letter from F. J. Leitz to File, August 15), Hanford Works, Richland, Washington.

HW-17088, 1950, *The Underground Disposal of Liquid Wastes at the Hanford Works, Washington*, General Electric Company, Richland Washington

HW-18492, 1950, *Settling and Dissolution Characteristics and Composition of Hanford Waste Metal Sludge*, Hanford Works, Richland, Washington.

HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants, February 5, 1951,* General Electric Company, Richland Washington.

HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland Washington

HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.

HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.

HW-25301, 1952, *Process Waste Disposal Summary – 200 Areas January 1952 through June 1952*, General Electric Company, Richland, Washington

HW-25533-DEL, 1952, *Hanford Works Monthly Report for August 1952*, General Electric Company, Richland, Washington.

HW-25781-DEL, 1952, *Hanford Works Monthly Report for September1952*, General Electric Company, Richland, Washington.

HW-26047-DEL, 1952, *Hanford Works Monthly Report for October1952*, General Electric Company, Richland, Washington.

HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.

HW-27775, 1953, *Separations Section, Waste Status Summary March 31, 1953*, General Electric Company, Richland, Washington.

HW-27838, 1952, *Waste Status Summary Period: April, May, and June 1952*, General Electric Company, Richland, Washington.

HW-27839, 1952, *Waste Status Summary Period: July, August and September 1952*, General Electric Company, Richland, Washington.

HW-27840, 1953, *Waste Status Summary Period: October, November and December1952*, General Electric Company, Richland, Washington.

HW-27841, 1953, *Separations Section, Waste Status Summary January 1953*, General Electric Company, Richland, Washington.

HW-27842, 1953, *Separations Section, Waste Status Summary February 1953*, General Electric Company, Richland, Washington.

HW-27932-DEL, 1953, *Hanford Works Monthly Report for April 1953*, General Electric Company, Richland, Washington.

HW-28043, 1953, *Separations Section, Waste Status Summary April 30, 1953*, General Electric Company, Richland, Washington.

HW-28267-DEL, 1953, *Hanford Works Monthly Report for May 1953*, General Electric Company, Richland, Washington.

HW-28121, 1953, *Release of Radioactive Wastes to Ground*, General Electric Company, Richland, Washington

HW-28377, 1953, *Separations Section, Waste Status Summary May 31, 1953*, General Electric Company, Richland, Washington.

HW-28576-DEL, 1953, *Hanford Works Monthly Report for June 1953*, General Electric Company, Richland, Washington.

HW-28712, 1953, *Separations Section, Waste Status Summary June 30, 1953*, General Electric Company, Richland, Washington.

HW-28906-DEL, 1953, *Hanford Works Monthly Report for July 1953*, General Electric Company, Richland, Washington.

HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland Washington

HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.

HW-33544, 1954, *Separations Section, Waste Status Summary for October 1954*, General Electric Company, Richland, Washington.

HW-33903, 1954, *Design Criteria "B" Plant Reactivation – 4X Program*, Rev. 1, General Electric Company, Richland, Washington.

HW-34412, 1955, *Separations Section, Waste Status Summary for December 1954*, General Electric Company, Richland, Washington.

HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report, May 16, 1955*, W. W. Schulz, General Electric Company, Richland Washington.

HW-38401, 1955, *Separations Section, Waste Status Summary for July 1955*, General Electric Company, Richland, Washington.

HW-38562, 1953, *Radioactive Contamination in Liquid Wastes Discharged to the Ground at the Separations Facilities Thru June 1955*, General Electric Company, Richland, Washington

HW-7-4640, 1946, *Project Proposal – Additional Concentration Building Waste Facilities (361-By-Pass): Project No. C-104*, Hanford Engineering Works, Richland, Washington.

HW-74647, 1962, *Chemical Processing Department Waste Status Summary for January 1, 1962 through June 30, 1962*, General Electric Company, Richland, Washington.

HW-78817, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Hanford atomic Products Operation, Richland, Washington.

HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report for October 1946*, General Electric Company, Richland, Washington.

LA-UR-96-3860, 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, Los Alamos National Laboratory, Los Alamos New Mexico

LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

RPP-19822, 2004, *Hanford Defined Waste Model -Revision 5*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-ER-310, 1996, *Supporting Document for the Historical Tank Content Estimate for the B-Tank Farm*, Rev. 1, ICF Kaiser Hanford Company, Richland, Washington.

Wilmarth, S. R., 2002, *Transuranic Calculations for Twelve Tanks*, letter number 7G300-02-JGF-009, dated October 2, 2002, CH2M HILL Hanford Group, Inc., Richland, Washington.

APPENDIX A

WASTE STATUS SUMMARY REPORTS

[redacted] Security Information

HW-27838
Page 1

This document declassified
by V.R. Chapman

Distribution

Co 1 - D. McDonald/VR Chapman
C. 2 - GK Carpenter
Co 3 - VD Donihee
Co 4 - Yellow File
Co 5 - 300 File

This document consists of 37 pages

[redacted]

WASTE STATUS SUMMARY

Period: April, May and June, 1952

Classification Cancelled and Changed To
Declassified
By Authority of DOC 1973
By A.E. Barber
Verified By J.P. Derouin

Buzz Hammer 3/15/96
APPROVED FOR PUBLIC RELEASE

SPECIAL RE-REVIEW
FINAL DETERMINATION
DECLASSIFICATION CONFIRMED
BY Buzz Hammer DATE Aug 16, 1995
BY J.D. Briggs DATE 8/17/95
Pat Duncan 3-15-96
Liz Rice 3-22-96

A.C. Morganthaler
Planning & Scheduling Group
Waste Control
Manufacturing Department

INSPECTED BY
R. Allen 7-29-02
NAME DATE
PNNL NSAT

[redacted]

BEST AVAILABLE COPY

[redacted] Security Information

[redacted]

-1-

DECLASSIFIED

0 02

WASTE STATUS SUMMARY
SEPARATIONS-OPERATIONS

Month of April, 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	7	58
Gals. increase in Metal Waste volume	22,6[illegible]8	165,000
Gals./Run average Metal Waste volume	2,9[illegible]7 *	2,[illegible]
Reserve Gals. available for Metal Waste on 4/30/52	1,693	1,936
Runs of First Cycle Waste sent to farm during the month	7	66
Gals. increase in First Cycle Waste volume	22,000	160,000
Gals./Run average First Cycle Waste volume	3,142	2,424
Reserve Gals. available for First Cycle Waste on 4/30/52	1,131	2,444

Remarks: * Average computed after correcting line #2 for 2 [illegible] runs and 1 Bicarbonate flush (1244 + 957)

	S Plant
Batches equivalent to 6-3 MS product content contributing to make-up of waste	115.96
Gallons increase in fission product waste storage*	324,500
Tons of Uranium (as-charged) processed to contribute to make-up of waste	83.14
Gallons/batch equivalent to 6-3 MS	2,815
Gallons per ton of Uranium processed	3,929
Reserve Gallons available for Redox waste on 4/30/52	8,771

Remarks: * During the month of February a 21% discrepancy between amount of waste sent versus amount of waste received in storage existed. The variation this month between these two figures was less than 1%.

BEST AVAILABLE COPY

H-2902.01-X 3-52

DECL[illegible]

[redacted]

[redacted]

HW-27?38

[redacted] -2- DECLASSIFIED

0 03

WASTE STORAGE STATUS

As of 4/30/53

METAL WASTE

FARM	Gallons x 10³ In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	Reserve Capacity In Batches
EAST AREA				
B	1579		1579	
C	3374		3374	
BX	3117		3117	23
BY	4389	23	4412	604
TOTAL	12459	23	[illegible]	627
WEST AREA				
T	1579		1579	
U	4737	(1579)	3158	
TX	5489	165	5654	232
TY				558**
TOTAL	11805	165	10391	790

REMARKS: *Reserve capacity at 2700* Gallons per batch

** The present plan is to allocate 101-102TY to Redox reserves and give equivalent space in U farm to T plant for metal waste storage. This would eliminate the necessity of completing the removal facilities in TY farm. (Removal facilities are now available in U farm). This plan requires that a cascade become available in U farm before 106TX, the present T plant metal waste tank, is filled.

( ) Metal waste in 101-102-103 U slurrying for TBP feed.

H-5902.02-X 6-52

BEST AVAILABLE COPY

DECLASSIFIED

[redacted]

[redacted] [redacted] -3- DECLASSIFIED

WASTE STORAGE STATUS

[illegible]

URANIUM CONTENT
METAL WASTE

TANK	TONS			
	In Storage Beg. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	[illegible]			[illegible]
C	[illegible]			[illegible]
BX	[illegible]			[illegible]
BY	[illegible]			[illegible]
TOTAL	[illegible]			[illegible]
WEST AREA				3,027
T	375			375
U	[illegible]		[illegible]	772
TX	[illegible]	[illegible]		[illegible]
TY				
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]

* Tons of uranium transferred as metal waste to [illegible] Waste [illegible] Group for slurrying.

REMARKS: April [illegible] based on [illegible] tons of uranium [illegible] is based on 600 [illegible] average.

DEA-5

BEST AVAILABLE COPY

H-[illegible] 4-52

[redacted]

[redacted] [redacted]

DECLASSIFIED

0 05

WASTE STORAGE STATUS

As of 4/30/52

FIRST CYCLE WASTE

FARM	Gallons x 10³ In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	* Reserve Cap. In Batches
EAST AREA					
B	1,060			1,060	
Evaporator Feed Tank - 106 B)	233		54	187	123
C	3,039		496	2,543	224
BX	3,175			3,175	
BY	2,086	22		2,108	58
TOTAL	9,493	22	642	9,073	405
WEST AREA					
T	1,920			1,912	
U	1,585		687	898	
TX	1,176	160		1,336	374
Evaporator Feed Tank - 118 TX)	69		280	[illegible]	[illegible]
TY					
TOTAL	4,740	160	[illegible]	4,493	1,020

* Reserve Capacity at 2,800 gallons per batch.
) Not included in totals.

REMARKS:

BEST AVAILABLE COPY

DECLASSIFIED

A- 6

H-2902.04-X 4-52

[redacted] [redacted]

[redacted] [redacted] -5- DECLASSIFIED

0 06

WASTE STORAGE STATUS

As of [illegible]/30/52

SECOND CYCLE WASTES

	Cascade In Use	Gallons x 10³		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	110-111-112-[illegible]	[illegible]	[illegible] **	3,065
WEST AREA	110-111-112-T	[illegible]	[illegible]	3,140
TOTAL		[illegible]	[illegible]	6,205

REMARKS: * [illegible] combined 5-6 to 2nd cycle only.
** [illegible] 5-1-52.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10³		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	20[illegible]-203-[illegible]	[illegible]	166	512 **
WEST AREA	203-202-T	[illegible]	187	255 runs*
TOTAL		261	3[illegible]	767

REMARKS: * Reserve capacity [illegible] based on sludge reading 5/[illegible]/52. 1[illegible]5 [illegible] in 20[illegible], 20[illegible], [illegible] reserve runs in 201-T.
** Reserve capacity [illegible] based on [illegible] readings = 232 runs in tanks 204, 20[illegible], 202 and [illegible].

*** Basis = 1[illegible]0 gal/inch of sludge.

BEST AVAILABLE COPY

H-2902.05-X 4-52

DECLASSIFIED

[redacted] DECLASSIFIED HW-27837

WASTE STORAGE STATUS

0 07

As of 4/30/52

TBP WASTE

FARM	In Storage Begin Mo.	TBP Gallons x 10³ Metal Waste Received	In Storage End Mo.	Reserve Capacity
EAST AREA				
B				
C				
BX				
BY				
TOTAL				
WEST AREA				
T				1,263
U				216
TX				
TY				3,110
TOTAL				4,589

* Supernate tanks, 109 BY and 115 TX not included in the above.

Gallons x 10³ of condensate to crib ________

Ratios - Feed to Waste

During Month ________

Cumulative to date ________

** Feed adjusted to metal waste equivalent

REMARKS: 216,000 gal. in 200-W region allocated to TBP wastes.

DEC A-8

BEST AVAILABLE COPY

H-2002.06-3 4-52

[redacted] [redacted]

[redacted]

-7-

[redacted]STE STORAGE STATUS

DECLASSIFIED As of 4/30/57

WASTE EVAPORATOR

FARM	Gallons x 10^3			
	Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B		122		654
C	442			
BX				
BY				
TOTAL	442	122	320	654
WEST AREA				
T				
U	407			
TX		112		166
TY				
TOTAL	407	112	395	166

REMARKS:

REDOX WASTE

FARM	Gallons x 10^3			**
	In Storage Beg. Mo.	Waste Received	In Storage End Mo.	Reserve Capacity In Batches
S Farm	356	325	681	2,970
*U Farm				
TOTAL	356	325	681	2,970

. Gallons x 10^3 of condensate to crib 390

* Will be considered as Redox reserve capacity when empty.

BEST AVAILABLE COPY

** Reserve Capacity at 2,815 gallons per 6-3 equivalent batch based on current month's performance.

REMARKS:

DECLASSIF A-9

H-2002.07-X 4-52

[redacted]

-3-

9

[redacted]

STATUS OF WASTE FARMS

DECLASSIFIED

	*Type of Waste	Gallons x 10³		Reserve Cap.		Remarks
		Capacity	Stored	Gallons x 10³	In Batches	
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	528			
104	1C	530	530			
105	1C	530	530			
106	1C	530	187	343	123	1st Cycle Evaporator Feed Tank
107	EB	530	220	310		
108	EB	530	501	29		Bottoms tank now filling
109	EB	530	10	525		
110	2C	530	530			
111	2C	530	530			Active cascade B Plant
112	2C	542	542			Cascading to crib
201	224	54.5	54.5			
202	224	54.5	54.5			Active cascade 224-B
203	224	54.5	54.5			
204	224	54.5	54.5			Cascading 204, 203, 202 to crib Idle
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	528			
104	MW	530	530			
105	MW	530	530			
106	MW	530	528			
107	1C	530	399	131	47	
108	1C	530	34	496	177	Finished pumping 4-15-52
109	1C	530	525			
110	1C	530	530			
111	1C	530	530			
112	1C	530	525			
201	MW	54.5	54.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	52.5			

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 = 224 Bldg. Waste
TBP = TBP Waste
EB = Evaporator Bottoms

BEST AVAILABLE COPY

H-2902.08-X 4-52

DECLASSIFIED

[redacted]

[redacted]

STATUS OF WASTE FARMS

Tank	Type of Waste*	Gallons x 10³ Capacity	Gallons x 10³ Stored	Reserve Capacity Gallons x 10³	Reserve Capacity In Batches	Remarks
[illegible] Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	530			
108	1C	530	530			
109	1C	530	530			
110	1C	530	530			
111	1C	530	530			
112	1C	530	530			
DY Farm						
101	[illegible]	758	758			
102	[illegible]	758	758			
103	[illegible]	758	661	83	31	
104	[illegible]	758	758			
105	[illegible]	758	491	267	99	
106	[illegible]	758		747	272	
107	1C	758	758			
108	1C	758	758			
109	TBP	758				Supernate tank
110	1C	758	597	[illegible]	[illegible]	[illegible] tank now filling [illegible] Plant
111	[illegible]	758	758			
112	[illegible]	758	225	533	190	[illegible] tank now filling [illegible] Plant
[illegible] Farm						
101	[illegible]	530	530			
102	[illegible]	530	530			
103	[illegible]	530	518			
104	1C	530	530			
105	1C	530	530			
106	1C	530	526			
107	1C	530	245	285		
108	1C	530	73	457		Reserved for [illegible]
109	1C	530	4	521		

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - [illegible] Waste
224 = 224 Bldg. Waste
TBP = TBP Waste
EB. = Evaporator Bottoms

H-[illegible] [illegible] -52

[redacted]

DECLASSIFIED

[redacted]

-10-

STATUS OF WASTE FARMS

0 10

	* Type of * Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
T Farm						
110	2C	530	530			
111	2C	530	530			~~Active cascade to T Plant~~
112	2C	569	569			~~Cascading to crib~~
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			~~Cascading to crib~~ ~~Idle~~
U Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			~~Sluicing for feed to TBP~~
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	336	194		~~Down to sludge 4/28/52~~
111	1C	530	[illegible]			~~Pump now installed here~~
112	1C	530	32	498		~~Stopped pumping 4/24/52~~
201	TBP	54.5		52.5		~~Plan even ground filling with TBP waste~~
202	TBP	54.5		54.5		
203	TBP	54.5		54.5		
204	TBP	54.5		[illegible]		
TX Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	750			
105	MW	758	758			
106	MW	758	758			
107	MW	758	758			
108	MW	758	356	391	232	~~MW tank now filling - T Plant~~
109	1C	758	574	184	66	~~1-C tank now filling - T Plant~~
110	1C	758	9	749	268	
111	1C	758		758	271	
112	1C	758		758	269	

* MW - Metal Waste
* 1C - First Cycle Waste
2C - Second Cycle
R - Redox Waste
7 - 222,1?-X 4-52

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

[redacted]

BEST AVAILABLE COPY

[redacted]

DECLASSIFIED

[redacted] [redacted]

STATUS OF WASTE FARMS

0 12

	Type of Waste	Gallons x 10³ Capacity	Gallons x 10³ Stored	Reserve Capacity Gallons x 10³	Reserve Capacity In Batches	Remarks
TX Farm (cont'd)						
113	[illegible]	758	[illegible]	166		
114	[illegible]	758	[illegible]			
115	[illegible]	[illegible]				Active ... [illegible]
116	[illegible]	758	[illegible]			
117	[illegible]	758	[illegible]			
118	[illegible]	758	[illegible]	[illegible]	[illegible]	
TY Farm						
101		758			[illegible]	
102		[illegible]		[illegible]	[illegible]	
103	[illegible]	758		[illegible]		
104	[illegible]	758		[illegible]		
105	[illegible]	758		[illegible]		
106	[illegible]	758		[illegible]		
S Farm						
101	[illegible]	758		[illegible]	[illegible]	
102	[illegible]	758		[illegible]	[illegible]	
103		758		[illegible]	[illegible]	
104	[illegible]	758		[illegible]	[illegible]	
105	[illegible]	758		[illegible]	[illegible]	
106	[illegible]	758		[illegible]	[illegible]	
107	[illegible]	758		[illegible]	[illegible]	
108	[illegible]	758		[illegible]	[illegible]	
109		758		[illegible]	[illegible]	
110	[illegible]	758	[illegible]	[illegible]	[illegible]	
111	[illegible]	758		[illegible]	[illegible]	
112	[illegible]	758		[illegible]	[illegible]	

* MW = Metal Waste
1C = First Cycle Waste
2C = Second Cycle Waste
R = Redox Waste

224 = 224 Bldg Waste
TBP = TBP Waste
DB = Evaporator Bottoms

** Redox reserve capacity based on current month's operating averages

H-2902.11-N 4-52

BEST AVAILABLE COPY

[redacted]

[redacted]

[redacted]

DECLASSIFIED

HW-7838

13

WASTE STATUS SUMMARY

Month of May, 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	6	21
Gals. increase in Metal Waste volume	13,061	55,000
Gals./Run average Metal Waste volume	2,177	2,619 *
Reserve Gals. available for Metal Waste on 5-30-52	1,669,000	1,811,000
Runs of First Cycle Waste sent to farm during the month	6	18
Gals. increase in First Cycle Waste volume	22,000	41,250
Gals./Run average First Cycle Waste volume	3,667	2,292
Reserve Gals. available for First Cycle Waste on 5-30-52	1,187,000	2,625,000

Remarks: * After correction for 2 RW runs sent to storage during this time, the average volume per run is 2,221 gallons.

	S Plant
Bismuth Phosphate Batch Equivalents	121.52
Gallons increase in fission product waste storage	342,532
Tons of Uranium, (as charged), processed, to contribute to make-up of waste	78.73
Gallons/batch equivalent to 6-3 MS	2,748
Gallons per ton of Uranium processed	4,351
Reserve Gallons available for Redox waste on 6-1-52	8,045,000

Remarks: * Last month this figure was reported at 3,997 gal/ton; on 5-19-52 an error was found in the calculated amount of uranium charged to extraction, which gave a corrected figure of 4,687 gal/ton. This month's figure of 4,351 gal/ton is based on preliminary uranium inventory figures.

H-2902.01-X 9-52

DECLAS A-14

BEST AVAILABLE COPY

HW-27838

14
~~18~~

WASTE STORAGE STATUS

As of 5-31-52

METAL WASTE

FARM	Gallons x 10³			Reserve Capacity In Batches*
	In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	
EAST AREA				
B	1,579		1,579	
C	3,374		3,374	
BX	3,117		3,117	23
BY	4,412	13	4,425	595
TOTAL	12,482	13	12,495	618
WEST AREA				
T	1,579		1,579	
U	4,737	(2,579)	4,737	
TX	5,654	55	5,709	120
TY	[illegible]		[illegible]	558
TOTAL	11,970	55	12,025	682

REMARKS: *Reserve capacity at 2,700 Gallons per batch.

( ) Metal waste in 101-102-103-U slurrying for TBP feed.

DECLASSIFIED

[redacted]

HW-27833

15

~~0-14~~

WASTE STORAGE STATUS

As of 5-31-52

URANIUM CONTENT
METAL WASTE

FARM	TONS PURE URANIUM In Storage Beg. Mo.*	Received	** To TBP	In Storage End Mo.
EAST AREA				
B	385			385
C	843			843
BX	762			762
BY	1,059	5		1,064
TOTAL	3,847	5		3,852
WEST AREA				
T	375			375
U	772		**	772
TX	1,297	11		1,308
TY				
TOTAL	2,444	11		2,455

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: ** Metal in tank 101-102-103 U equal to 405 tons has been credited to TBP. This does not show as uranium present in totals.

May increase based on 0.622 tons of uranium per run. This is based on 600 MwD/ton average.

DECLASSIFIED

BEST AVAILABLE COPY

HW-27838

[redacted]

DECLASSIFIED

16

WASTE [illegible] STATUS

AS of [illegible]

FIRST CYCLE WASTE

TANKS	Gallons x 10³				
	In Storage [illegible]	1st Cycle Waste [illegible]	Feed To [illegible]	To Storage [illegible]	*Reserve [illegible] No Batches
EAST AREA					
B ##	1,060			1,060	
Evaporator Feed Tank - 106 B	187		38	225	20
C	2,543		425	2,118	376
BX	3,175			3,175	
BY	2,108	22		2,130	88
TOTAL	9,073	22	388	8,707	564
WEST AREA					
T	1,910			1,910	
U	898		516	382	[illegible]
TX ##	1,336	41		1,377	859
Evaporator Feed Tank - 118 TX	349		187	536	79
TY					
TOTAL	4,493	41	329	4,205	938

* Reserve Capacity at 2,800 gallons per batch
( ) Not included in totals

REMARKS: ## Excluding 106-B and 118-TX evaporator feed tanks.

A-17

H-2902?04-X 6-52

DECLASSIFIED

BEST AVAILABLE COPY

[redacted] DECLASSIFIED HW-27335

~~Page 16~~ 17

WASTE STORAGE STATUS

As of 5-31-52

SECOND CYCLE WASTES

	Cascade In Use	Gallons x 10³		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	110-111-112 B	21	403	3,059
WEST AREA	110-111-112 T	36	671	2,154***
TOTAL		57	1,074	

REMARKS: ** Reserve calculations based on 215 gal/run combined 5-6 and 2nd cycle only, or 275 gal/run and 75 gallons on sludge per run from 224 Bldg.

*** Assuming 224 wastes with 2nd cycle and 5-6 wastes to give a total sludge volume of 350 gal/run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10³		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	204-203-202 B	26	166	506
WEST AREA 5-29	203-202 T 110-111-112 T	115	187	Combined with 2nd cycle above
TOTAL		141	353	506

REMARKS: On 5-29-52, 224-T wastes were tied into 5-6 stream feeding to 110-111-112 T at diversion box 241-152-T. Thus in 200 West Area 5-6, 2nd cycle, and 224 wastes are all combined in these tanks.

H-3902-05-X 4-52

DECLASSIFIED

BEST AVAILABLE COPY

HW-27536

~~0-17~~ 18

[redacted] STORAGE STATUS

DECLASSIFIED

As of 5-31-52

TBP WASTE

FARM	In Storage Beg. Mo.	TBP Received	In Storage End Mo.	Reserve Capacity
	Gallons x 10³			
EAST AREA				
B				
C				
BX				
BY				
TOTAL				
WEST AREA				
T				1,263
U				216
TX				
TY				3,110
TOTAL				4,589

Supernate tanks, 109 BY and 115 TX not included in the above.

Gallons x 10³ of condensate to crib ________

Ratio: * Feed to Waste.

During Month ________

Cumulative to date ________

* Feed adjusted to metal waste equivalent.

REMARKS: Present plan is to store cold-start up wastes of 10 g/liter and under in 200-W tanks; if over 10 g/liter to send it to 115-TX supernatant tank for reworking.

For hot TBP wastes: if 10 g/l or less to discard to current TBP waste storage tanks; if between 10-32 g/l (up to 25% of metal content in feed) to be discarded into T Plant current MW cascade.

H-2702.06-X 4-52

BEST AVAILABLE COPY

DECLASSIFIED

[redacted]

HW-2 7836

As of 5-31-52

[redacted]

WASTE EVAPORATOR

FARM	Gallons x 10^3 Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B		93	-	761
C	388			
BX				
BY				
TOTAL	388	93	295	761
108-B filled with bottoms 5-14-52. 109-B into service 5-15-52.				
WEST AREA				
T				
U	329			
TX		96		370
TY				
TOTAL	329	96	233	370

REMARKS: 110,111,112-U tanks are not emptied to sludge; tanks remaining to evaporate in 200 West area are 114-TX and cascade 104,105,106-T which filled 3-31-52.

REDOX WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Waste Received	In Storage End Mo.	Reserve Capacity In Batches **
S Farm	681	343	1,024	2,905
SX Farm				
TOTAL	681	343	1,024	2,905

Gallons x 10^3 of condensate to crib 387

* 113 is considered as Redox reserve capacity when empty.

** Reserve Capacity at 2,744 gallons per 6-3 equivalent batch

REMARKS: 110-S tank cascaded to 111-S on 5-9-52.

BEST AVAILABLE COPY

DECLASSIFIED

H-2902.37-X 4-52

[redacted]

STATUS OF WASTE FARMS

	Type of Waste*	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Cap. Gallons x 10^3	Reserve Cap. In Batches	Remarks
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			
105	1C	530	530			
106	1C	530	225	300	120	1st Cycle Evaporator - Feed Tank
107	EB	530	220	310		
108	EB	530	530		-	
109	EB	530	74	451		Bottoms tank - now filling
110	2C	530	530			Active Cascade - B Plant
111	2C	530	530			
112	2C	542	542			Cascading to crib
201	224	54.5	54.5			Active Cascade - 224-B
202	224	54.5	54.5			
203	224	54.5	54.5			Cascading 204, 203, 202 to crib
204	224	54.5	54.5			Idle
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	1C	530	399	131	47	
108	1C	530	34	496	177	
109	1C	530	525			
110	1C	530	530			
111	1C	530	530			
112	1C	530	99	426	152	Tank - last [illegible]
201	MW	54.5	54.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	52.5			

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

DECLASSIFIED

[redacted] STATUS OF WASTE [illegible]

0 20

	* Type of Waste	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	530			
108	1C	530	530			
109	1C	530	530			
110	1C	530	530			
111	1C	530	525			
112	1C	530	530			
BY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	664	83	31	
104	MW	758	758			
105	MW	758	491	267	99	
106	MW	758		747	277	
107	1C	758	758			
108	1C	758	753			
109	TBP	758				Supernate tank
110	1C	758	619	[illegible]	18	1C tank now filling [illegible] B Plant.
111	MW	758	758			
112	MW	758	238	509	183	MW tank now filling at B Plant.
T Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			
105	1C	530	530			
106	1C	530	528			
107	1C	530	245	285		Reserved for TBP
108	1C	530	73	457		
109	1C	530	4	521		

BEST AVAILABLE COPY

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

[redacted]

H-2902.09-X 4-52

[redacted]

DECLASSIFIED

[illegible] 27238

0 22

STATUS OF [illegible]

	* Type of Waste	Gallons x 10³		Remaining Capacity		Remarks
		Capacity	Stored	Gallons x 10³	In Batches	
Farm						
110	2C	530	530			Active cascade - T Plant
111	2C	530	530			
112	2C	569	569			Cascading [illegible]
201	224	54.5	54.5			These 4 tanks out of service 5-29-[illegible]
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						
101	MW	530	530			
102	MW	[illegible]	530			Sluicing for feed to TBP
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	336	194		
111	1C	530	14	516		
112	1C	530	32	498		
201	TBP	54.5		32.5		Plan overground filling with TBP waste
202	TBP	54.5		54.5		" " "
203	TBP	54.5		54.5		" " "
204	TBP	54.5		54.5		" " "
TX Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	758			
105	MW	758	758			
106	MW	758	758			
107	MW	758	758			
108	MW	758	413	[illegible]	[illegible]	[illegible] filling - T Plant
109	2C	758	625	[illegible]	[illegible]	[illegible] filling - T Plant
110	2C	758	0	[illegible]	[illegible]	
111	2C	758		[illegible]	[illegible]	
112	2C	758		[illegible]	[illegible]	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle
R - Redox Waste
TBP - TBP Waste
[illegible]

H-2902.10-X 1-52

BEST AVAILABLE COPY

DECLASSIFIED

HW-27738

DECLASSIFIED

[redacted]

~~8~~ 23

STATUS OF WASTE FARMS

	Type of Waste*	Gallons x 10³		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10³	In Batches	
TX Farm (cont'd)						
113	EB	758	388	370	-	
114	1C	758	751			
115	TBP					Active - TBP supernate
116	EB	758	758			
117	EB	758	756			
118	1C	758	536	222	79	Evaporator feed tank
TY Farm						
101	MW	758		758	281	
102	MW	758		747	277	
103	TBP	758		758		
104	TBP	758		747		
105	TBP	758		758		
106	TBP	758		747		
S Farm					**	
101	R	758		758	277	
102	R	758		758	277	
103	R	758		747	273	
104	R	758		758	277	
105	R	758		758	277	
106	R	758		747	273	
107	R	758		758	277	
108	R	758		758	277	
109	R	758		747	273	
110	R	758	274		-	
111	R	758	249	509	186	Active tank
112	R	758		747	273	

* MW = Metal Waste
1C = First Cycle Waste
2C = Second Cycle Waste
R = Redox Waste

224 = 224 Sludge Waste
TBP = TBP Waste
EB = Evaporator Bottoms

BEST AVAILABLE COPY

H-2902.11-X 4-52

DECLASSIFIED

DECLASSIFIED

HW-27838

~~0-23~~ -4

[redacted]

Month of June, 1952

[redacted]

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	6	16
Gals. increase in Metal Waste volume	13,750	49,500
Gals./Run average Metal Waste volume	2,292	3,094
Reserve Gals. available for Metal Waste on 7-1-52	1,655,000	1,791,000
Runs of First Cycle Waste sent to farm during the month	7	17
Gals. increase in First Cycle Waste volume	19,250	57,750
Gals./Run average First Cycle Waste volume	2,750	3,397
Reserve Gals. available for First Cycle Waste on 7-1-52	1,719,000	2,889,000

Remarks: Higher average volume per run on 1st cycle and MW for T Plant, in part due to increased volumes for processing I.P. runs.

	S Plant
Bismuth Phosphate Batch Equivalent	90.51
Gallons increase in fission product waste storage	264,000
Tons of Uranium, (as charged), processed, to contribute to make-up of waste	54.84
Gallons/batch equivalent to 6-3 MS	* 2,917
Gallons per ton of Uranium processed	* 4,814
Reserve Gallons available for Redox waste on 7-1-52	7,781,000

Remarks: * The increase in waste volumes for the month of June was principally the result of abnormal uranium rework.

BEST AVAILABLE COPY

[redacted]

H-2902.01-X 3-52

DECLASSIFIED

[redacted]

HW-27[illegible]3

WASTE STORAGE STATUS

[redacted]

DECLASSIFIED

[redacted]

METAL WASTE

FARM	Gallons x 10^3			Reserve Capacity In Batches
	In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	
EAST AREA				
B	1,579		1,579	
C	3,374		3,374	
BX	3,117		3,117	23
BY	4,425	14	4,439	590
TOTAL	12,495	14	12,509	613
WEST AREA				
T	1,579		1,579	
U	4,737	(1,579)	4,737	
TX	5,709	50	5,759	106
TY	MT	-	MT	558
TOTAL	12,025	50	12,075	664

REMARKS: *Reserve capacity at 2,700 Gallons per batch.

(1) Metal waste in 101-102-103-U slurrying for TBP feed.

BEST AVAILABLE COPY

2902.02-X 4-52

[redacted]

DECLASSIFIED

[redacted]

HW-27138

[redacted]

DECLASSIFIED

WASTE STORAGE STATUS

[redacted] as of 6-30-52

URANIUM CONTENT
METAL WASTE

FARM	TONS Uranium In Storage Beg. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	385			385
C	841			841
BX	762			762
BY	1,064	6		1,070
TOTAL	3,052	6		3,058
WEST AREA				
T	375			375
U	772			772
TX	1,308	13 & 5***		1,326
TY	-			-
TOTAL	2,455	13		2,473

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: ** Metal in tanks 101-102-103 U equal to 405 tons of uranium has been credited to TBP. This does not show as uranium present in totals.

June increase is for all runs having June serial numbers not necessarily in storage at month end.

*** Cold uranium sent from TBP Building to 115 TX (see TBP waste).

[redacted]

BEST AVAILABLE COPY

H-2 08.03-X 4-52

DECLASSIFIED

[redacted]

DECLASSIFIED

HW-2783

27

[redacted]

WASTE STORAGE STATUS

[redacted] as of 6-30-52

[redacted]

FARM	Gallons x 10^3				
	In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	Reserve Cap* In Batches
EAST AREA					
B **	1,060	-	-	1,060	-
Evaporator Feed Tank - 106 B	225	-	32	193	120
C	2,117	-	214	1,903	452
BX	3,175	-	-	3,175	-
BY	2,130	19	-	2,149	41
TOTAL	8,707	19	246	8,480	613
WEST AREA					
T	1,910	-	-	1,910	-
U	382	-	-	382	-
TX **	1,377	58	195	1,240	838
Evaporator Feed Tank - 118 TX	536	-	331	205	198
TY	-	-	-	-	-
TOTAL	4,205	58	526	3,737	1,036

* Reserve Capacity at 2,800 gallons per batch
( ) Not included in totals.

REMARKS: ** Excluding 106-B and 118-TX evaporator feed tanks. Tank 113-TX containing 753,000 gal. 1st cycle waste will be designated as Evaporator Bottoms Storage Tank when emptied.

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

HW-27835

DECLASSIFIED

28

WASTE STORAGE STATUS

[redacted] of 6-30-52

[redacted]

	Cascade In Use	Gallons x 10^3		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	110-111-112-B	15	407	3,044 **
WEST AREA	110-111-112-T	39	685	2,415 ***
TOTAL		54		

REMARKS: ** Reserve calculations based on storage of combined 5-6 and 2nd cycle only at 275 gallons per run.

*** Reserve calculation based on storage of combined 5-6, 2nd cycle, and 224 wastes at 350 gallons per run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10^3		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	204-203-202-B	40	167	500
WEST AREA	204-201-T	Inactive Cascade	187	
	110-111-112-T	86	Sludge for 110-112-T shown above.	
TOTAL		126	354	500

REMARKS:

[redacted]

H-2-02.05-X 4-52

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

[redacted]

HW 27838

WASTE STORAGE STATUS DECLASSIFIED

[redacted]

As of 6-30-52 29

[redacted]

FARM	In Storage Beg. Mo.	TBP Received	In Storage End Mo.	Reserve Capacity
	Gallons x 10^3			
EAST AREA				
B				
C				
BY				
BY				
TOTAL				
WEST AREA				
T				1,263
U				216
TX				
TY				3,110
TOTAL				4,589

Supernate tanks, 109 BY and 115 TX not included in the above.

Gallons x 10^3 of condensate to crib (216-W) - This calculation is not complete - will be available for next month's report.

[illegible] * Feed [illegible]ents

During Month --

Cumulative to date --

* Feed adjusted to metal waste equivalent

REMARKS: 10,991# cold uranium sent to 115-TX tank equal to 193,992 gallons received in 115-TX.

28,746 gallons of waste to ditch equivalent to 149.8 # cold uranium.

[redacted]

BEST AVAILABLE COPY

DECLASSIFIED

HW-27838

[redacted]

[redacted] 6-30-52

WASTE EVAPORATOR **DECLASSIFIED** [redacted] 30

FARM	Gallons x 10^3 Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B		98	148	663
C	246			
BX				
BY				
TOTAL	246	98	148	663
WEST AREA				
T				
U				
TX	526	144	382	421
TY				
TOTAL	526	144	382	421*

* 114-TX now pumping; reclaimed space designated as Evap. bottoms reserve space.
REMARKS: 109-C now pumping in East Area.

REDOX WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Waste Received	In Storage End Mo.	Reserve Capacity In Batches
S Farm	1,024	264	1,288	2,668
*U Farm	-	-	-	
TOTAL	1,024	264	1,288	2,668

Gallons x 10^3 of condensate to crib 292.

* Will be considered as Redox reserve capacity when empty.

** Reserve Capacity at 2,917 gallons per 6-3 equivalent batch

BEST AVAILABLE COPY

REMARKS: [redacted]

DECLASSIFIED

[redacted] [redacted]

H-2902.07-X 4-52

HW-27838

[redacted]

SECURITY [redacted] DECLASSIFIED

0 30

[redacted]

	Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Space Gallons x 10^3	Reserve Space In Batches	Remarks
D Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1 C	530	530			
105	1 C	530	530			
106	1 C	530	193	337	120	1st Cycle evaporator - Feed tank.
107	EB	530	220	310	-	
108	EB	530	530	-	-	
109	EB	530	172	353	-	Bottom tank - now filling.
110	2 C	530	530			Active cascade - B Plant.
111	2 C	530	530			
112	2 C	542	542			Cascading to crib.
201	224	54.5	54.5			Active cascade - 224-B.
202	224	54.5	54.5			
203	224	54.5	54.5			Cascading 204, 203, 202 to crib.
204	224	54.5	54.5			Idle
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	[illegible]	[illegible]	399	131	47	
108	1 C	530	34	496	177	
109	1 C	530	311	214	76	Tank - now pumping to 106-B. To be reserved for TBP supernate.
110	1 C	530	530			
111	1 C	530	530			
112	1 C	520	99	425	152	Partially pumped; to be finished at a later date.
[illegible]	MW	54.5	54.5			
[illegible]	MW	54.5	54.5			
[illegible]	MW	54.5	54.2			
[illegible]	MW	54.5	54.5			

DECLASSIFIED

MW - Metal Waste
1 C - First Cycle Waste
2 C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste

BEST AVAILABLE COPY

[redacted]

[redacted]

HW-27838

[redacted]
STATUS OF WASTE FARMS

[redacted] 0-32

	Type of Waste	Gallons x 10^3 Capacity	Stored	Reserve Capacity Gallons x [redacted]	In [redacted]	Remarks [redacted]
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1 C	530	530			
108	1 C	530	530			
109	1 C	530	530			
110	1 C	530	530			
111	1 C	530	525			
112	1 C	530	530			
BY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	664	83	31	
104	MW	758	755			
105	MW	758	491	267	99	
106	MW	758	-	747	277	
107	1 C	758	758			
108	1 C	758	753			
109	TBP	758				Supernate tank.
110	1 C	758	638	115	41	1-C tank now filling - B Plant.
111	MW	758	758			
112	MW	758	252	495	183	MW tank now filling - B Plant.
T Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1 C	530	530			Cascade filled 3-31-52. Next and last
105	1 C	530	530			cascade of 1st cycle waste to evaporate
106	1 C	530	528			in West area. To take place after sufficient allowance for aging.
107	1 C	530	245			TBP - waste - active cascade.
108	1 C	530	73			
109	1 C	530	4			

MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
[redacted]

DECLASSIFIED

DECLASSIFIED BEST AVAILABLE COPY

[redacted]

HW-27838

STATUS OF WASTE FARMS DECLASSIFIED

33

[redacted]

	* Type of Waste	Gallons x 10³ Capacity	Gallons x 10³ Stored	Reserve Capacity Gallons x 10³	Reserve Capacity In Batches	Remarks
T Farm						
110	224 and 2 C	530	530			Active cascade - T Plant.
111	224 and 2 C	530	530			
112	224 and 2 C	569	569			Cascading to crib.
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						
101	MW	530	530			Cascading - now slurrying for feed to TBP plant.
102	MW	530	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
[illegible]	MW	530	519			
110	1 C	530	336	194		Cascade being held as Redox reserve space.
111	1 C	530	14	516		
112	1 C	530	32	498		
201	TBP	54.5		52.5		Plan overhead filling with TBP waste.
202	TBP	54.5		54.5		
203	TBP	54.5		54.5		
204	TBP	54.5		54.5		
TX Farm						
[illegible]	MW	[illegible]	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	750			
105	MW	758	758			Cascade set up to receive high TBP wastes in addition to MW from T plant.
106	MW	758	758			
107	MW	758	758			
[illegible]	MW	758	461	206	103	MW tank now filling via 107 TX - T plant.
109	1 C	758	673	85	30	1-C tank now filling - T plant.
110	1 C	758	9	749	268	
[illegible]	1 C	758		758	271	
[illegible]	1 C	758	[redacted]			

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle
R - Redox Waste

[redacted]
EB - Evaporator Bottoms
[redacted]

H-2002.10-X 4-52

BEST AVAILABLE COPY

DECLASSIFIED

[redacted]

HW-27838

[redacted] 34

STATUS OF WASTE TANKS

[redacted]

	Type of Waste*	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
TX Farm (cont'd)						
113	EB	758	532	226	-	Active bottoms tank - West area.
114	1C	758	558	195	-	Tank now pumping - reclaimed space to
115	TBP					active TBP supernate; be designated as EB.
116	EB	758	758	-		
117	EB	758	756	-		
118	1C	758	205	553	198	Evaporator feed tank.
TY Farm						
101	MW	758		758	261	
102	MW	758		747	277	
103	TBP	758		758	-	
104	TBP	758		747	-	
105	TBP	758		758	-	
106	TBP	758		747	-	
S Farm						
101	R	758	-	758	**260	
102	R	758	-	758	260	
103	R	758	-	747	256	
104	R	758		758	260	
105	R	758	-	758	260	
106	R	[illegible]	-	747	256	
107	[illegible]	758	-	758	260	
108	R	758	-	758	260	
109	R	758	-	747	256	
110	R	758	774	-	-	
111	R	758	513	245	84	Active tank.
112	R	758	-	747	255	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

** Reserve figures based on current months average number of gallons per batch equivalent 2,917 gal/batch.

H-2902.11-X 4-52

[redacted]

BEST AVAILABLE COPY

[redacted] A-35

DECLASSIFIED

[redacted] Security [redacted]

HW-27839
Page 1

Distribution

Copy 1 - D. McDonald
V.R. Chapman
2 - C.K. Carpenter
3 - V.D. Donihee
4 - 300 File
5 - Yellow
6 - Extra
7 - Extra

[redacted]

~~This document classified by V. R. Chapman~~

WASTE STATUS SUMMARY

Period: JULY, AUGUST AND SEPTEMBER 1952

Classification Cancelled and Changed To
DECLASSIFIED
By Authority of DOE 1973
By H.E. Balbec 5-10-82
Verified By N.P. DERAIN

A.C. Morganthaler
Planning & Scheduling Group
Waste Control
Manufacturing Department
SEPARATIONS SECTION

SPECIAL RE-REVIEW
FINAL DETERMINATION
DECLASSIFICATION CONFIRMED
BY Buzz Vamora DATE Aug 19, 1995
BY J. A. Beggs DATE 8/17/95
Pat Cimaw 3-15-96
L.K. Rice 3-13-96

3-15-96
Buzz Vamora
APPROVED FOR
PUBLIC RELEASE

DECLASSIFIED

[redacted]

A-36

INSPECTED BY
R M Iten 7-29-02
NAME DATE
PNNL NSAT

BEST AVAILABLE COPY

[redacted] Security Information

[redacted]

DECLASSIFIED 27839

Month of July, 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	8	38
Gals. increase in Metal Waste volume	19,250	(1) 104,500
Gals./Run average Metal Waste volume	2,406	(2) 2,785
Reserve Gals. available for Metal Waste on 8-1-52	1,636,000	1,687,000
Runs of First Cycle Waste sent to farm during the month	8	36
Gals. increase in First Cycle Waste volume	15,125	122,000
Gals./Run average First Cycle Waste volume	1,890	(3) 3,388
Reserve Gals. Available for First Cycle Waste on 8-1-52	(4) 243,000	3,487,000

Remarks:
(1) Includes 1720 gallons of uranium waste from Bldg. 321 - 300 Area. See (uranium waste).
(2) From T Plant process only.
(3) High average volume per run due in part to increased volumes resulting from processing [illegible].
(4) Drop in 1st cycle reserve capacity for 200-E Area due to reallocation of space in tank farm 241-C to [illegible] waste [illegible] system.

	S Plant
Bismuth Phosphate Batch Equivalent	128.43
Gallons increase in fission product waste storage	245,280
Tons of Uranium, (as charged), processed, to contribute to make-up of waste	77.2
Gallons/batch equivalent to 6-3 MS	8,688
Gallons per ton of Uranium processed	4,473
Reserve Gallons available for Redox waste on [illegible]	3,433,000

Remarks: Includes only space available in tank farm 241-S.

[redacted]

DECLASSIFIED

H-2902.01-X 3-52

BEST AVAILABLE COPY

27839

[redacted]

DECLASSIFIED

[redacted] WASTE STORAGE STATUS

As of 7-31-52

METAL WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	Reserve Capacity In Batches
EAST AREA				
B	1,579		1,572	
C	[illegible]		3,374	
BX	3,117		3,117	23
BY	4,439	19	4,453	583
TOTAL	12,508	19	12,523	606
WEST AREA				
T	1,579		1,573	
U	4,737	(1,572)	4,733	
TX	5,750	105	5,861	47
TY	[illegible]		[illegible]	553
TOTAL	12,075	105	[illegible]	625

REMARKS: *Reserve capacity at 2,700 Gallons per batch.

( ) [illegible]

DECLASSIFIED

[redacted]

H-2902.02-X 4-52

BEST AVAILABLE COPY

[redacted]

HW- 27839
2-4

WASTE STORAGE STATUS DECLASSIFIED

As of 7-31-52

URANIUM CONTENT
METAL WASTE

FARM	TONS DEPLETED URANIUM			
	In Storage Beg. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	383			383
C	837			837
BX	753			753
BY	1,064.93	3.50	(1) -10.67	1,057.76
TOTAL (5)	3,042.93	3.50	-10.67	3,035.76
WEST AREA				
T	374			374
U	770			770
TX	1,322.08	24.97 (2)(3)		1,347.05
TY				
TOTAL	2,466.08	24.97		2,491.05 (4)

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: (1) Adjustment for loss of 10.67 tons uranium via overflow of 102 BX in Feb., 1951.
(2) Includes 0.41 tons of unreacted metal received on 7-2-52 into 102-TX tank from Bldg. 321 - 300 Area.
(3) Includes 1.77 tons of depleted and decontaminated metal into 115-TX tank from TBP.
(4) Total does not include metal in tank 101-102-103-U now sluicing for feed to TBP Plant.
(5) All uranium storage figures have been adjusted to equal those kept by S.F. Accountability group.

DECLASSIFIED

BEST AVAILABLE COPY

H-3803.03-X 4-52 corrected 8/15/52

[redacted]

[redacted] D DECLASSIFIED 27839

[redacted]

WASTE STORAGE STATUS

As of 7-31-52

FIRST CYCLE WASTE
AND COATING WASTE
[illegible]

FARM	Gallons x 10^3 In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	* Reserve Cap. In Batches
EAST AREA					
B **	1,060			1,060	-
Evaporator Feed Tank - 101 B	193		(-) 193	322	69
C	1,903		(-) 845	1,058	To TBP process
BX	3,175			3,175	
BY	2,149	15		2,164	28
TOTAL	8,180	15	845	7,[illegible]	67
WEST AREA					
T	1,[illegible]			[illegible]	
U	382			382	
TX **	1,240	122	555	807	1,063
Evaporator Feed Tank - 105 TX	205		(-) 33	244	184
TY					
TOTAL	3,737	122	516	3,343	1,247

* Reserve Capacity at 1,100 gallons per batch

( ) Not included in total

REMARKS: ** Excluding evaporator feed tanks.

DECLASSIFIED

[redacted]

BEST AVAILABLE COPY

[redacted] A-40

HW 27839

[redacted]

DECLASSIFIED

WASTE STORAGE STATUS

[redacted] 7-31-52

SECOND CYCLE WASTES

	Cascade In Use	Gallons x 10^3		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	110-111-112-B	21	409	3,036 **
WEST AREA	110-111-112-T	93	698	2,377 ***
TOTAL		114	1,107	5,413

REMARKS: ** Reserve calculations based on storage of combined 5-6 and 2nd cycle only at 275 gallons/run.

*** Reserve calculations based on storage of combined 5-6, 2nd cycle, and 224 wastes at 350 gallons/run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10^3		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	204-203-202-B	24	168	402
WEST AREA	204-201-T 110-111-112-T	In active cascade 116	187 Sludge & reserve shown with 2nd cycle.	
TOTAL		140	355	402

REMARKS:

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

H-2902.05-X 4-52

[redacted] A-41

[redacted]

-27839

DECLASSIFIED

[redacted]

WASTE STORAGE STATUS

As of 7-31-53

[redacted]

TBP WASTE

FARM	Gallons x 10^3			
	In Storage* Beg. Mo.	TBP Waste Received	In Storage End Mo.	Reserve* Capacity
EAST AREA				
B				
C				(3) 2,100
BX				
BY				
TOTAL				2,100
WEST AREA				
T				1,263
U				216
TX		(1) 177		
TY				3,110
TOTAL				4,589

Supernate tanks, 109 BY and 115 TX not included in the above.

(216-W)
Gallons x 10^3 of condensate to crib 606

Ratio: * Feed to Waste

During Month ______________

Cumulative to date ______________

** Feed adjusted to metal waste equivalent.

BEST AVAILABLE COPY

REMARKS: (1) Waste to 115-TX = 177 x 10^3 gallons equivalent to 1.77 tons of decontaminated and depleted uranium.
(2) Waste to ditch 52 x 10^3 gallons = 1.01 tons of decontaminated and depleted uranium.
(3) Space released by East Area evaporation from cascades 241-C 107,8,9, and 110,11,12 [redacted]

A-42

DECLASSIFIED

27839

1-2

[redacted]

DECLASSIFIED

As of 7-31-52

[redacted]

FARM	Gallons x 10^3			
	Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B		223	425	142
C	616			
BX				
BY				
TOTAL	616	223	425	142
WEST AREA				
T				
U				
TX	516	143	373	268
TY				
TOTAL	516	143	373	268

REMARKS:

REDOX WASTE

FARM	Gallons x 10^3			** Reserve Capacity In Batches
	In Storage Beg. Mo.	Waste Received	In Storage End Mo.	
S Farm	1,287	345	1,632	2,766
* [illegible] Farm				
TOTAL	1,287	345	1,632	2,765

• Gallons x 10^3 of condensate to crib 362

* Will be considered as Redox reserve capacity when empty.

** Reserve Capacity at 2,688 gallons [redacted]

REMARKS: Additional storage space equal to 1,200,000 gallons is available for Redox wastes in tanks 110-112 [illegible]

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

27839

DECLASSIFIED

[illegible]	530			
[illegible]	530			
[illegible]	530			
[illegible]	530			
[illegible]	530			
[illegible]	532	133	[illegible]	(after dumping batch E-1 8-1-52) [illegible] feed tank.
[illegible]	2200	310		
[illegible]	530			
[illegible]	373	137		Active bottom tank - East [illegible]
[illegible]	530			Active cascade - B Plant
[illegible]	530			
[illegible]	532			Tank 112-B cascades to crib.
[illegible]	54.5			Active cascade - [illegible]
[illegible]	54.5			
[illegible]	54.5			Tank 202-B [illegible] to crib.
[illegible]	54.5			Tank [illegible]
[illegible]	530			
[illegible]	530			
[illegible]	[illegible]			
[illegible]	530			
[illegible]	530			
[illegible]	[illegible]			
[illegible]	399	131		Space allocated to TBP waste [illegible]
[illegible]	36	165		"
[illegible]	17	502		" finished pumping 7-25-52.
				finished pump-
[illegible]	231	299		Space allocated to TBP, inc 7-22-52.
[illegible]	237	293		Tank pumping at south end; to be held
[illegible]	140	379		Space allocated to TBP, for TBP.
[illegible]	54.5			
[illegible]	54.5			
[illegible]	[illegible]			

[redacted]

[illegible] Waste
[illegible] Cycle Waste
Second Cycle Waste
[illegible] Waste

224 - [illegible] Bldg. Waste

BEST AVAILABLE COPY

[redacted]

DECLASSIFIED

HW 27839
p. 13

[redacted]

STATUS [redacted]

DECLASSIFIED

	Type of Waste	Gallons [redacted]		[redacted] Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	530			
108	1C	530	530			
109	1C	530	530			
110	1C	530	530			
111	1C	530	525			
112	1C	530	530			
BY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	664	93	31	
104	MW	758	758			
105	MW	758	491	267	99	
106	MW	758	-	757	277	
107	1C	758	758			
108	1C	758	753			
109	TBP	758				TBP supernate tank - 200 East Area
110	2C	758	653	105	38	2-C tank now filling - B Plant
111	MW	758	758			
112	MW	758	271	476	176	MW tank now filling - B Plant
T Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			Content of cascade will be aged 1
105	1C	530	530			year, 3-31-53
106	1C	530	528			
107	1C	530	245	285	-	Space allocated to TBP waste
[illegible]	1C	530	73	457	-	
[illegible]	1C	530	4	[redacted]		

MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - [illegible] Waste

224 - 224 Bldg. Waste
TBP - TBP Waste [redacted]

DECLASSIFIED
BEST AVAILABLE COPY

[redacted]

27839

STATUS OF WASTE FARMS

DECLASSIFIED

	Type of Waste*	Gallons x 10[redacted]		[redacted] Capacity		Remarks
		Capacity	Stored	Gallons x 103	In Batches	
T Farm						
110	224&2C	530	530			Active cascade - T Plant
111	224&2C	530	530			
112	224&2C	529	529			112-T cascades to crib
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						
101	MW	530	530			Cascade now slurrying for feed to TBP Plant.
102	MW	530	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	336	194		Cascade being held as Redox waste reserve.
111	1C	530	14	516		
112	1C	530	32	498		
201	TBP	54.5	-	52.5		Plan overhead filling with TBP waste.
202	TBP	54.5	-	54.5		
203	TBP	54.5	-	54.5		
204	TBP	54.5	-	54.5		
TX Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	750			
105	MW	758	758			Cascade now receiving high TBP wastes in addition to T Plant metal wastes.
106	MW	758	758			
107	MW	758	758			
108	MW	758	[illegible]	101	67	Active MW tank - T Plant
109	1C	758	758			Tank filled on Run 7-12-C7-1 Recd. 7-25-5[illegible]
110	1C	758	45	713	255	
111	1C	758				
112	1C	758	[redacted]			

* MW - Metal Waste
* 1C - First Cycle Waste
2C - Second Cycle Waste

224 - 224 Bldg. Waste

BEST AVAILABLE COPY

DECLASSIFIED

[redacted]

[redacted]

27839
1/2

STATUS OF WASTE FARMS **DECLASSIFIED**

	* Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
TX Farm (cont'd)						
113	EB	758	675	83	-	Active bottoms tank - West Area,
114	1C	758	4	749	268	pumping stopped 7-11-52
115	TBP					active TBP supernate
116	EB	758	758	-	-	
117	EB	758	756	-	-	
118	1C	758	244	514	184	Evaporator feed tank
TY Farm						
101	[illegible]	758		758	261	
102	[illegible]	758		747	277	
103	TBP	758		758	-	
104	TBP	758		747	-	
105	TBP	758		758	-	
106	TBP	758		747	-	
S Farm						
101	R	758		758	282 **	
102	R	758		758	282	
103	R	758		747	278	
104	R	758		758	282	
105	R	758		758	282	
106	R	758		747	278	
107	R	758		758	282	
108	R	758		758	282	
109	R	758		747	278	
110	R	758	[illegible]	-	-	
111	R	758	755	-	-	Tank cascaded to 112-S 7-25-52
112	R	758	103	644	240	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

BEST AVAILABLE COPY

** Reserve figures for storage in tank [redacted] on Redox current 2,688 gallons/batch.

H-2902-11-X 4-52

[redacted]

A-47

DECLASSIFIED

[redacted]

HW 27839 p.13

DECLASSIFIED

WASTE STATUS SUMMARY

[redacted]

Month of August 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	1 run - 4 AW	46
Gals. increase in Metal Waste volume	20,625	132,000
Gals./Run average Metal Waste volume	--	2,870
Reserve Gals. available for Metal Waste on 9-1-52	1,615,000	784,000
Runs of First Cycle Waste sent to farm during the month	1 run - 5½ AW	49
Gals. increase in First Cycle Waste volume	26,125	110,000
Gals./Run average First Cycle Waste volume	--	2,245
Reserve Gals. available for First Cycle Waste on 9-1-52	202,000	2,791,000

Remarks: (1) Tank 241-TX-114 added to T plant MW reserve.

(2) Averages not calculated for B plant since they no longer have production significance.

	S Plant
Bismuth Phosphate Batch Equivalent	166.76
Gallons increase in fission product waste storage	405,780
Tons of Uranium, (as charged), processed, to contribute to make-up of waste	109.4
Gallons/batch equivalent to 6-3 MS	2433 (1)
Gallons per ton of Uranium processed	3709
Reserve Gallons available for Redox waste on 9-1-52	(2) 7,027,000

Remarks: (1) This figure represents a 12% variation from average plant performance which cannot be entirely accounted for by August process changes.

(2) Includes reserve [redacted] lines are available at present to allocated reserves in U and TY farms.

DECLASSIFIED

BEST AVAILABLE COPY

H 2-4101-A 4-52

[redacted] DECLASSIFIED 27839 p.14

[redacted]

[redacted] As of 8-31-52

METAL WASTE

FARM	Gallons x 10^3			Reserve Capacity In Batches
	In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	
EAST AREA				
B	1572		1572	
C	3374		3374	
[illegible]	3117		3117	23
BY	4458	21	4479	575
TOTAL	12528		12549	598
WEST AREA				
T	1572		1572	
U	4737 (2)		4737	
TX	5865	141 (2)	6005 (1)	220 (3)
TY	MT		MT	None (4)
TOTAL	12180		12321	220

REMARKS: *Reserve capacity at 2700 Gallons per batch

(1) MW in cascade 101-102-103-U slurrying for TBP feed.

(2) Includes 2000 Gallons received from TBP plant.

(3) 241-TX-106 tank pumping overground at month end to tank 114TX. Metal waste reserve increase due to addition of 114TX to metal waste account.

(4) Reserve space in tanks 241-TY-101-2 removed from Metal waste account and transferred to Redox reserves because of incomplete removal facilities in these tanks.

[redacted]

H-2702.02-X 4-52 [redacted] DECLASSIFIED

BEST AVAILABLE COPY

HW 2..9
p.

[redacted]

WA[redacted] STORAGE STATUS **DECLASSIFIED**

As of 8-31-52

[redacted]

URANIUM CONTENT
METAL WASTE

FARM	TONS In Storage Beg. Mo.	Received	* To TBP	In Storage End. Mo.
EAST AREA				
B	383			383
C	837			837
BX	758			758
BY	1057.76	--	--	1057.76
TOTAL	3035.76			3035.76
WEST AREA				
T	374			374
U	770			770
TX	1347.05	29.66 (1)		1376.71
TY				
TOTAL	2491.05	29.66		2520.71 (2)

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: (1) Includes 1.51 tons from TBP (decontaminated and depleted).

(2) Total does not include metal in tanks 241-U-101-102-103 now sluicing for feed to TBP plant (405 tons)

[redacted]

[redacted]

DECLASSIFIED

H-2068.23-X.4-52.

BEST AVAILABLE COPY

[redacted]

No. 27839
p.15

WASTE STORAGE STATUS DECLASSIFIED

As of 8-31-52

[redacted]

URANIUM CONTENT
METAL WASTE

FARM	TONS In Storage Beg. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	383			383
C	837			837
BX	758			758
BY	1057.76	--	--	1057.76
TOTAL	3035.76			3035.76
WEST AREA				
T	374			374
U	770			770
TX	1347.05	29.66 (1)		1376.71
TY	--			
TOTAL	2491.05	29.66		2520.71 (2)

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: (1) Includes 1.51 tons from TBP (decontaminated and depleted).

(2) Total does not include metal in tanks 241-U-101-102-103 now sluicing for feed to TBP plant (405 tons)

[redacted]

[redacted]

H-[illegible] 3.03-X 4-52

DECLASSIFIED
BEST AVAILABLE COPY

HW-27839 p.16

DECLASSIFIED

[redacted] 8-31-52

FIRST CYCLE WASTE
AND COATING WASTE
T AND B PLANTS

FARM	Gallons x 10^3				
	In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	* Reserve Cap In Batches
EAST AREA					
B **	1060		-309	751	--
Evaporator Feed Tank - 106 B	392		+10	402	46
C	1058		[illegible]	727	--
BX	3175			[illegible]	
BY	2164	26		2190	26
TOTAL	7849	26	-630	7245	72
WEST AREA					
T	1910			1910	
U	382			382	
TX **	807	110		917	755 (1)
Evaporator Feed Tank - 118 TX	244		-154	90	242
TY	--			--	
TOTAL	3343	110	-154	3299	997

* Reserve Capacity at 2800 gallons per batch
( ) Not included in totals.

REMARKS: ** Excluding evaporator feed tanks.

(1) Tank 241-TX-114 has been converted to metal waste storage account causing a loss of 268 batches to 1st cycle waste reserve (see Metal waste storage).

DECLASSIFIED

[redacted]

BEST AVAILABLE COPY

doc 27839
p. 17

[redacted]

WASTE STORAGE STATUS

DECLASSIFIED

8-31-5[illegible]

[redacted]

SECOND CYCLE WASTES

	Cascade In Use	Gallons x 10^3		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	110-111-112-B	21	411	3030 **
WEST AREA	110-111-112-T	99	715	2328 ***
TOTAL		120	1126	5358

REMARKS: ** Reserve calculations based on storage of combined 5-6 and 2nd cycle only at 275 gallons of sludge per run.

*** Reserve calculation based on storage of combined 5-6, 2nd cycle, and 224 wastes at 350 gallons of sludge per run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10^3		Estimated Reserve Capacity In Batches
		Cribbed	Sludge	
EAST AREA	204-203-202-B	29	169	486
WEST AREA	204-201-T 110-111-112-T	inactive cascade 155	187 sludge and reserv	-- shown with 2nd cycle
TOTAL		184	356	486

REMARKS:

[redacted]

BEST AVAILABLE COPY

DECLASSIFIED

HW-27839
p. 18

BEST AVAILABLE COPY

[redacted]

WASTE STORAGE STATUS DECLASSIFIED

[redacted]

As of 8-31-52

[redacted]

TBP WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	TBP Waste Received	In Storage End Mo.	Reserve Capacity
EAST AREA				
B				
C				2443 (4)
BX				
BY				
TOTAL				2443
WEST AREA				
T				1263
U				216
TX		9 (3)		
TY				3110
TOTAL				4589

Supernate tanks, 109 BY and 115 TX not included in the above.

Gallons x 10^3 of condensate to crib 565 (216) (1)(2)

Ratio: * Feed to Waste

During Month ______

Cumulative to date ______

* Feed adjusted to metal waste equivalent

REMARKS. (1) Includes 0.79 tons of depleted and decontaminated uranium.

(2) In addition to the amount cribbed, 242,000 gallons containing 0.79 tons of decontaminated and depleted uranium were ditched.

DECLASSIFIED

(3) 9000 gallons of waste were sent [redacted] -105 active metal waste cascade. This waste contained 1.51 tons of decontaminated and depleted Uranium.

(4) Reserve space has increased during m[redacted] 1st cycle evaporation.

H-2202.06-X 4-52

[redacted]

HW-27839
p. 17

BEST AVAILABLE COPY

WASTE STORAGE STATUS

DECLASSIFIED

As of 8-31-52

W[redacted]

[redacted]

FARM	Gallons x 10^3 Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B	299	203	427	548 (1)
C	331			
BX				
BY				
TOTAL	630	203	427	
WEST AREA				
T				
U				
TX	154	45	102	38 (2)
TY				
TOTAL	154	45	102	

REMARKS: (1) Bottoms reserve has increased due to pumping of 105-B, a future bottoms tank.
(2) Re-evaporation of bottoms tanks 116-117 and 113 TX to begin in near future to obtain additional bottoms reserve space.

REDOX WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Waste Received	In Storage End Mo.	** Reserve Capacity In Batches
S Farm	1632	406	2038	2558 (1)
*U Farm				
TOTAL	1632			2558

Gallons x 10^3 of condensate to crib 381

* Will be considered as Redox reserve [redacted] when [illegible]

** Reserve Capacity at 2750 (2) gallons per 6-3 equivalent batch

REMARKS: (1) Additional Redox [redacted] in tanks 241-U-110, 111, 112 and 241-TY-101-102 could [redacted] 1,208,000 and 1,505,000 gallons respectively.
(2) Based on average of [redacted]

DECLASSIFIED

HW-27202.07-X 4-52

HW-27839
9.20

[redacted]

STATUS OF WASTE FARMS

DECLASSIFIED

[redacted]

	Type of Waste**	Gallons x 10³ Capacity	Stored	[redacted] x 10³	[redacted] Batches	Remarks
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			
105	1C	530	221	309	E.B.	Tank now being pumped to 106-B
106	1C	530	402	128	46	Evap. feed tank
107	EB	530	298	232		Active bottoms tank-East Area Evap.
108	EB	530	530			
109	EB	530	518	7	--	Aug. 21, 1952 - switched to 107-B
110	2C	530	530			Active cascade - B plant
111	2C	530	530			
112	2C	542	542			Tank 112-B cascades to crib
201	224	54.5	54.5			Active cascade - 224-B
202	224	54.5	54.5			
203	224	54.5	54.5			202-B flows to crib
204	224	54.5	54.5			204-B is idle
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	1C	530	399	131		All space in tanks 107-112C
108	1C	530	34	496		allocated to TBP waste reserve
109	1C	530	10	515		
110	1C	530	231	299		
111	1C	530	36	474		Finished pumping to 106-B 8-2-52
112	1C	530	17	508		Finished pumping to 106-B 8-15-52
201	MW	54.5	54.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	54.5			

[redacted]

** MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator [redacted]

BEST AVAILABLE COPY

DECLASSIFIED

H-2902.08-A 4-52

[redacted]

HW-27839
p. 21

DECLASSIFIED

STATUS OF WASTE TANKS

	Type* of Waste	Gallons x 10^3		Res[redacted]apacity		Remarks
		Capacity	Stored	Gallons x 10^3	In [redacted]	
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	520			
108	1C	530	530			
109	1C	530	520			
110	1C	530	520			
111	1C	530	525			
112	1C	530	530			
UY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	664	93	31	
104	MW	758	758			
105	MW	758	421	267	99	
106	MW	758	--	741	277	
107	1C	758	758			
108	1C	758	[illegible]			
109	TBP	758		758		TBP supernate tank 200 East Area
110	1C	758	679	79	26	
111	MW	758	758			
112	MW	758	292	455	168	
T Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			
105	1C	530	530			contents of cascade will be aged
106	1C	530	528	[redacted]		[redacted] 3-31-53, after which time [redacted]oration will be started
107	1C	530	245	285		Space allocated to TBP waste
108	1C	530	73	457		
109	1C	530	4	515	[redacted]	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

H-2902.09-X 4-52

DECLASSIFIED
BEST AVAILABLE COPY

[redacted]

27839

DECLASSIFIED

STATUS OF WASTE FARMS

[redacted]

	* Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
T Farm						[redacted]
110	224 & 2C	530	530			Active cascade -- T Plant
111	224 & 2C	530	530			
112	224 & 2C	559	559			112-T cascades to crib
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						
101	MW	530	530			Cascade now slurrying for feed to TBP Plant
102	MW	[illegible]	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	336	194	** 71	Cascade being held as Redox waste reserve
111	1C	530	14	516	187	
112	1C	530	32	498	181	
201	TBP	54.5	--	52.5		Plan overhead filling with TBP waste
202	TBP	54.5	--	54.5		
203	TBP	54.5	--	54.5		
204	TBP	54.5	--	54.5		
TX Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	750			
105	MW	758	758			
106	MW	758	758			
107	MW	758	758	[redacted]		[redacted] to 114 TK on 5-29-52
108	MW	758	697	60	18	
109	1C	758	758	--	--	
110	1C	758	[illegible]	602	215	Tank [redacted] filling T plant 1st cycle
111	1C	758	--	758	[redacted]	
112	1C	758	--	[illegible]	[redacted]	

* MW - Metal Waste
* 1C - First Cycle Waste
2C - Second Cycle
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
ER [redacted]

HW-[illegible] 4-52

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

HW 27839
p.23

STATUS OF WASTE FARMS

DECLASSIFIED

[redacted]

	Type of Waste*	Gallons x 10³ Capacity	Gallons x 10³ Stored	Reserve Capacity Gallons x 10³	Reserve Capacity In Batches	Remarks
TX Farm (cont'd)						
113	EB	758	720	38	--	
114	1C & MW	758	13	[illegible]	272	started filling 8-29-52 from 106 TX [illegible]
115	TBP					
116	EB	758	758			
117	EB	758	756			
118	1C	758	90	[illegible]	242	Evap.
TY Farm						
101	R	758		758	276**	Space reserve transferred to Redox account - Tank 101 and 102
102	R	758		747	272	
103	TBP	758		758		
104	TBP	758		747		
105	TBP	758		758		
[illegible]	TBP	758		747		
S Farm						
101	R	758		758	276**	
102	R	758		758	276	
103	R	758		747	272	
104	R	758		758	276	
105	R	758		758	276	
106	R	758		747	272	
107	R	758	67	621	251	tank started filling 8-25-52
108	R	758		758	276	
109	R	758		747	272	
110	R	758	774	--	--	
111	R	758	755	--	--	
112	R	758	442	305	111	cascade abandoned on 8-25-52 because of boiling in tank 110-S

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 [redacted]
TBP - TBP Waste
EB - Evaporator Bottoms

** Reserve f[redacted]e in tank farm 241-S and tanks 101[redacted] average plant performance of 2750 gallons per batch.

2902.11-X 4-52

DECLASSIFIED
BEST AVAILABLE COPY

HW 27839
C.5-24

WASTE STATUS SUMMARY

DECLASSIFIED

[redacted]

[redacted]th of September 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	1 water flush	8
Gals. increase in Metal Waste volume	2060	20600
Gals./Run average Metal Waste volume	- (1)	2575
Reserve Gals. available for Metal Waste on 10/1/52	1,613,000	773,000
Runs of First Cycle Waste sent to farm during the month	10-1/2 AW	5 & 1 AW
Gals. increase in First Cycle Waste volume	43,300	22,000
Gals./Run average First Cycle Waste volume	- (1)	3550 (2)
Reserve Gals. available for First Cycle Waste On 10/1/52	113,000	2,114,000

Remarks: (1) Averages not calculated for B Plant since runs are not of normal size.

(2) T Plant first cycle waste average calculated after correcting for volume of acid wash.

	S Plant
Bismuth Phosphate Batch Equivalent	156.41
Gallons increase in fission product waste storage	390,500
Tons of Uranium, (as charged), processed, to contribute to make-up of waste	96.72
Gallons/batch equivalent to B-3 [illegible]	2497
Gallons per ton of Uranium processed	4037
Reserve Gallons available for Redox waste on 10/1/52	(3) 6,636,000

Remarks: (3) [illegible] S Farm only; 2,713,000 gallons of reserve space are immediately [illegible] if a tie line is made between Redox system and [illegible] system.

DECLASSIFIED

H-[illegible] [redacted]

BEST AVAILABLE COPY

[redacted]

NW-27839
p. 75

[redacted]

DECLASSIFIED

WASTE STORAGE STATUS

As of 9/30/52

METAL WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	Reserve Capacity* In Batches
EAST AREA				
B	1579		1579	
C	3374		3374	
BX	3117		3117	23
BY	4479	2	4481	574
TOTAL	12549	2	12551	597
WEST AREA				
T	1579		1579	
U	4737 (1)		4737	
TX	6005	21 (-7) (2)	6019	287
TY	MT		MT	None
TOTAL	12321	14	12335	287

REMARKS: *Reserve capacity at 2700 Gallons per batch

(1) Metal waste in cascade 241-U-101-102-103 slurrying for TBP feed.

(2) By transferring metal waste from 241-TX-106 to 241-TX-114 an apparent volume loss of 7,000 gallons occurred. This can be accounted for by the increase of density resulting from cooling liquid in the 106-TX tank prior to pumping to the 114-TX tank.

H-2202.02-X 4-52 [redacted]

DECLASSIFIED
BEST AVAILABLE COPY

[redacted]

27839

DECLASSIFIED

[redacted]

WASTE STORAGE STATUS

as of 9/30/52

URANIUM CONTENT
METAL WASTE

FARM	TONS In Storage Beg. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	383			383
C	837			837
BX	758			758
BY	1057.76			1057.76
TOTAL	3035.76			3035.75
WEST AREA				
T	374			374
U	770			770
TX	1376.71	4.92		1381.63
TY				
TOTAL	2520.71	4.92		2525.63(1)

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: (1) 405 tons of Uranium in cascade 241-U-101-102-103 now slurrying for feed to TBP Plant not included in this total.

[redacted] DECLASSIFIED

BEST [illegible] COPY

[redacted]

HW 27839

[redacted] WASTE STORAGE STATUS **DECLASSIFIED**

As of 9/30/52

FIRST CYCLE WASTE AND COATING WASTE
T AND B PLANTS

FARM	In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	* Reserve Cap. In Batches
	Gallons x 10³				
EAST AREA					
B **	751		-169	582	
Evaporator Feed Tank - 106 B	402		+ 46	448	29
C	427			727	
BX	3175			3175	
BY	2190	43	-414	1819	11
TOTAL	7245	43	-537	6751	40
WEST AREA					
T	1910			1910	
U	382			382	
TX **	917	22	3	936	747
Evaporator Feed Tank - 118 TX	90	(708)1	63	735	8
TY	-			-	
TOTAL	3299	730	66	3963	755

* Reserve Capacity at 2800 gallons per batch.
( ) Not included in totals.
**Excludes evaporator feed tanks 106-B and 118-TX.

NOTES: (1) Adjusted to include 712,000 gallons of bottoms supernate received from 110-TX bottoms tank to 118-TX, and loss of 4,000 gallon heel in 114-TX tank [illegible] total waste storage.

[redacted] **DECLASSIFIED**

[redacted]

H-5302-C4-X 4-51

BEST AVAILABLE COPY

No. 27839

[redacted]

[redacted] ASTE STORAGE STATUS DECLASSIFIED

As of 9-30-52

SECOND CYCLE WASTES - SECTION 5 WASTES

	Cascade In Use	Gallons x 10^3 Cribbed	Gallons x 10^3 Sludge	Estimated Reserve Capacity In Batches
EAST AREA	110-111-112-B	89	414	3020**
WEST AREA	110-111-112-T	85	717	2352
TOTAL		174	1131	5372

REMARKS: 61,000 gallons to Sec. 5 - 200-E, and 68,000 to Sect. 5- 200 W, included in crib figures.

**Reserve calculations based on storage of combined 5-6 & 2nd cycle only at 275 gallons of sludge per run.

**Reserve calculations based on storage of combined 5-6, 2nd cycle, and 224 wastes at 350 gallons of sludge per run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10^3 Cribbed	Gallons x 10^3 Sludge	Estimated Reserve Capacity In Batches
EAST AREA	204-203-202-B	42	170	476
WEST AREA	204-201-T 110-111-112-T	Inactive cascade 60	187 Sludge of reserve shown with 2nd cycle.	-
TOTAL		102	357	476

REMARKS:

DECLASSIFIED

[redacted]

H-2902.05-X 4-52

[redacted]

BEST AVAILABLE COPY

[redacted]

DECLASSIFIED

Doc 27839
p. 7

BEST AVAILABLE COPY

WASTE [redacted] STATUS

[redacted]

As of 9-30-52

TBP WASTE

FARM	Gallons x 10³			
	In Storage Beg. Mo.	TBP Waste Received	In Storage End Mo.	Reserve Capacity
EAST AREA				
B				
C				2,443
BX				
BY				414 (1)
TOTAL		None		2,857
WEST AREA				
T				1,263
U				216
TX	380	---	380	
TY				3,110
TOTAL	380	None	380 (4)	4,589

Supernate tanks, 109 BY and 115 TX not included in the above.

Gallons x 10³ of condensate to crib 840 (2) (3)

Ratio, * Feed to Waste

During Month ---

Cumulative to date ---

* Feed adjusted to metal waste equiva[redacted]

REMARKS: 103-C to pump overground to 109-C (1st cycle tank) instead of 109-BY during October to permit slurrying of 101-102-103-C cascade.

(1) Space released in 107-BY by first cycle evaporation.

(2) Includes 0.48 tons at decontaminated and depleted uranium.

(3) In addition to the amount cribbed, 336,000 gallons containing 2.97 tons of decontaminated and depleted uranium were ditched.

(4) 371,000 gallons of this was[redacted]

DECLASSIFIED

H-2902.06-X 4-52

[redacted]

27839

BEST AVAILABLE COPY

[redacted]

WASTE STORAGE STATUS

[redacted]

As of 9-31-52

[redacted]

WASTE EVAPORATOR

DECLASSIFIED

FARM	Gallons x 10^3			
	Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B	123	162	375	554
C				
BX				
BY	414			
TOTAL	537	162	375	[illegible] (1)
WEST AREA				
T				
U				
TY	66	30	36	720
TX				
TOTAL	66	30	36	720 (2)

REMARKS: (1) Bottoms reserve has increased due to pumping 105-B and part of 104-B to evaporator feed tank. (2) Temporary increase due to contents of 116 TX bottoms tank being pumped to 110 TX feed TX feed tank for re-evaporation.

REDOX WASTE

FARM	Gallons x 10^3			** Reserve Capacity In Batches
	In Storage Beg. Mo.	Waste Received	In Storage End Mo.	
S Farm	2,038	391	2,429	[illegible] (1)
SU Farm				
TOTAL	2,038	391	2,429	[illegible]

Gallons x 10^3 of condensate to crib 342

DECLASSIFIED

* Will be considered as Redox reserve capacity when empty.

** Reserve Capacity at [redacted]

REMARKS: (1) Additional Redox reserve space is now available in tanks 241-S-110-111-112 and 241-TY-101-[redacted],000 and 1,505,000 gals. respectively.
(2) Based on average p[redacted]

H-3902.07-X 4-52 [redacted] A-66

[redacted]

-27839

BEST AVAILABLE COPY

[redacted]

STATUS OF WASTE FARMS

DECLASSIFIED

	* Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Cap. Gallons x 10^3	Reserve Cap. In Batches	Remarks
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	410	120	EB	Partially pumped to 106-B. Not down to sludge.
105	EB	530	172	358		Completed pumping - [illegible]/52.
106	1C	530	[illegible]	82	[illegible]	Evap. Feed Tank.
107	EB	530	461	69	EB	Active bottoms tk.-East Area evap.
108	EB	530	530			
109	EB	530	518	7	EB	
110	2C	530	530			Active cascade-B plant 2nd cycle &
111	2C	530	530			Section 5.
112	2C	542	542			Tank 112-B, cascaded to crib.
201	224	54.5	54.5			Active cascade - 224-B.
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			Supernate to pump to [illegible]-C.
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	1C	530	399	131	TBP	
108	1C	530	34	496	TBP	
109	1C	530	10	515	TBP	To receive TBP supernate from 103-C.
110	1C	530	231	299	TBP	
111	1C	530	36	494	TBP	
112	1C	530	17	508	TBP	
201	MW	54.5	54.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	54.5			

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
224 - 224 Bldg Waste
TBP - TBP Waste
EB - Evaporator Bottoms

DECLASSIFIED

H-2902.08-X 4-52

[redacted]

27839

STATUS OF WASTE FARMS

[redacted]

DECLASSIFIED

	* Type of Waste	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	530			
108	1C	530	530			
109	1C	530	530			
110	1C	530	530			
111	1C	530	525			
112	1C	530	530			
BY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	664	83	31	
104	MW	758	758			
105	MW	758	491	267	99	
106	MW	758	---	747	277	
107	1C	758	344	414	TBP	Partially pumped 9-25 to 9-28.
108	1C	758	753			
109	TBP	758	---	758		TBP supernate tank-200 East Area.
110	1C	758	722	31	11	Active-1st cycle tank-221-B.
111	MW	758	758			
112	MW	758	294	453	168	Active - MW tank - 221-B.
T Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			Contents of cascade will be aged 1 year - 3/1/53, after which evaporation may be started.
105	1C	530	530			
106	1C	530	528			
107	1C	530	245	285	TBP	
108	1C	530	73	457	TBP	
109	1C	530	4	515	TBP	

* MW - Metal Waste
1C = First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

[redacted] Ridge Waste

[redacted]

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

STATUS OF WASTE FARMS

[redacted]

DECLASSIFIED

	* Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
T Farm						
110	224 & 2C	530	530			Active cascade - T plant - 2nd
111	224 & 2C	530	530			cycle, 224 and Sect. 5 Waste.
112	224 & 2C	569	569			112-T cascades to crib.
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						Cascade now slurrying for feed
101	MW	530	530			to TBP Plant.
102	MW	530	530			
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	336	194	71 **	Cascade being held as Redox
111	1C	530	14	516	187	waste reserve.
112	1C	530	32	498	181	
201	TBP	54.5	---	52.5	TBP	
202	TBP	54.5	---	54.5	TBP	
203	TBP	54.5	---	54.5	TBP	
204	TBP	54.5	---	54.5	TBP	
TX Farm						
101	MW	758	758			
102	MW	758	758	8		
103	MW	758	758			
104	MW	758	750			
105	MW	758	758			
106	MW	758	95	663	246	Pumped to 114 TX on 9-5-52 over-
107	MW	758	758			ground.
108	MW	758	718	29	11	Active tank - 221-T - metal waste.
109	1C	758	758	---	---	Active cascade - 221-T - first
110	1C	758	178	580	207	cycle.
111	1C	758	---	758	271	
112	1C	758	---	753	269	

* MW - Metal Waste   224 - 224 Bldg. Waste
* 1C - First Cycle Wa[redacted]P - TBP Waste
2C - Second Cycle [redacted] - Evaporator Bottoms
R - Redox Waste
H-2902.10-X 4-52 [redacted]

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

27829 p. 34

DECLASSIFIED

STATUS OF WASTE FARMS

[redacted]

	* Type of Waste	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
TX Farm (cont'd)						
113	EB	758	750	8	---	
114	MW	758	666	81	30	Received from 106-TX, 9/6/52.
115	TBP	758	758	---	---	TBP supernate tank-200West Area
116	EB	758	46	712		Pumped to 118 TX for starting re-evaporation.
117	EB	758	756	---	---	
118	1C	758	735	23	8	Evaporator feed tank.
TY Farm						
101	R	758		758	276**	
102	R	758		747	272	
103	TBP	758		758	276	
104	TBP	758		747	272	
105	TBP	758		758	276	
106	TBP	758		747	272	
S Farm						
101	R	758		758	276	
102	R	758		758	276	
103	R	758		747	272	
104	R	758		758	276	
105	R	758		758	276	
106	R	758		747	272	
107	R	758	458	300	109	Active tank - Redox wastes.
108	R	758	---	758	276	
109	R	758	---	747	272	
110	R	758	774	---	---	
111	R	758	755	---	---	
112	R	758	442	305	111	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

** - Reserve figures for storage in tank farm 241-S and tanks 241-U-110-112; 241-TY-101-102. Based on average plant performance of 2,750 gallons per batch.

H-2902.11-X 4-52

DECLASSIFIED

[redacted]

BEST AVAILABLE COPY

DECLASSIFIED

HW-27840
Page 1

Distribution

Copy 1 - D. Mc Donald
V.R. Chapman
2 - O.K. Carpenter
3 - V.D. Dailhee
4 - W.N. Mobley
5 - 300 File
6 - Yellow
7 - Extra
8 - Extra

This document consists of 34 pages

No. of Copies, Series

WASTE STATUS SUMMARY Separations Section

Period: OCTOBER, NOVEMBER AND DECEMBER, 1952

A.C. Morganthaler
Planning & Scheduling Group
Waste Control
Manufacturing Department

" This Document Classified by:
V.R. Chapman "

~~Restricted Data
This document contains Restricted Data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.~~

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

HW-278[illegible]

Brown

[redacted] SECURITY INFORMATION

DECLASSIFIED

WASTE STATUS SUMMARY

(2)

Month of October 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	2 Bicarb. flushes	[illegible]
Gals. increase in Metal Waste volume	2,000	58,90[illegible]
Gals./Run average Metal Waste volume	- (1)	2,8[illegible]
Reserve Gals. available for Metal Waste on 11-1-52	1,556,000 (2)	708,0[illegible]
Runs of First Cycle Waste sent to farm during the month	2 AW	[illegible]
Gals. increase in First Cycle Waste volume	9,600	55,0[illegible]
Gals./Run average First Cycle Waste volume	- (1)	2,6[illegible]
Reserve Gals. available for First Cycle Waste on 11-1-52	304,000 (2)	2,076,0[illegible]

Remarks: (1) Since B-Plant batches have been of abnormal sizes, no averages have [illegible] been calculated. (2) In November 5-6, 2nd cycle, 1st cycle, and stack drainage wi[ll] be cribbed after passing through 110-111-112 B cascade. Metal waste flushes will [be] cribbed after passing through 200-[illegible] tank cascade. Because of these changes, B-Pla[nt] no longer requires first cycle and metal waste reserves. (3) Underground line co[n]necting 105 and 106-TX (T-Plant active metal waste cascade) was plugged at month end. This has resulted in an unusually high liquid level in the 105-TX tank. Me[tal] waste averages shown above are based on the assumption that none of this material has been lost to the ground.

		S Plant
Bismuth Phosphate Batch Equivalent		121.[illegible]
Gallons increase in fission product waste storage		323,0[illegible]
Tons of Uranium, (as charged), processed, to contribute to make-up of waste		73.6[illegible]
Gallons/batch equivalent to 6-3 MS		2,65[illegible]
Gallons per ton of Uranium processed	(1)	4,38[illegible]
Reserve Gallons available for Redox waste on 10-31-52	(2)	5,319,0[illegible]

Remarks: (1) This average shows an 8.5% increase per ton over September. This was due to increased waste volumes resulting from equipment changes in the third uranium cycle. The theoretical effect of these changes is 8.7%. (2) These reserves are those in tank farm 241-S only.

[redacted]

H-2902.01 [illegible]

[redacted] SECURITY INFORMATION

DECLASSIFIED

HW-27

[redacted] [redacted] SECURITY INFORMATION

DECLASSIFIED

3

WASTE STORAGE STATUS

As of 10-31-52

METAL WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	Reserve Capacity In Batches
EAST AREA				
B	1,579		1,579	
C	3,374		3,374 (1)	
BX	3,117		3,117	23
BY	4,481	57 (2)	4,538	553
TOTAL	12,551	57	12,608	576
WEST AREA				
T	1,579		1,579	
U	4,737		4,737 (1)	
TX	6,019	59	6,078	265
TY	---		---	---
TOTAL	12,335	59	12,394	265

REMARKS: *Reserve capacity at 2,700 Gallons per batch.

(1) Cascades 101-103 C and 101-103 U slurrying for TBP feed.

(2) Includes 2,000 gallons from B-Plant and 55,000 gallons from TBP-Plant.

H-2002.00-X 4-52

DECLASSIFIED

[redacted] BEST AVAILABLE COPY

[redacted] SECURITY INFORMATION

BEST AVAILABLE COPY

[redacted]

HW-27[illegible]

[redacted] SECURITY INFORMATION

WASTE STORAGE STATUS

DECLASSIFIED

As of 10-31-52

URANIUM CONTENT
METAL WASTE

FARM	TONS OF DEPLETED URANIUM			
	In Storage Beg. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	383			383
C	837	1.32 (1)	392 (4)	446.32
BX	758			758
BY	1,057.76	0.61 (2)		1,058.37
TOTAL	3,035.76	1.93		2,645.69
WEST AREA				
T	374			374
U	770	0.45 (3)		770.45
TX	1,381.63	13.62		1,395.25
TY				
TOTAL	2,525.63	14.07		2,539.70 (5)

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: (1) Uranium in recovered nitric acid sent to C Farm in September and October.

(2) 55,000 gallons from TBP-Plant to 111-112 BY.

(3) Uranium in recovered nitric acid sent to U-Farm in September and October.

(4) 392 tons of uranium in cascade 101-103 C transferred to TBP account.

(5) 405 tons of uranium in cascade 101-103 C not included in this total.

[redacted]

DECLASSIFIED

[illegible] [redacted] SECURITY INFORMATION

~~SECRET~~

~~RESTRICTED SECURITY INFORMATION~~

HW - 278

DECLASSIFIED

(5)

BEST AVAILABLE COPY

WASTE STORAGE ST

As of 10-31-52

FIRST CYCLE WASTE AND COATING WASTES

T AND B PLANTS

FARM	Gallons x 10^3				
	In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	Reserve In Batch
EAST AREA					
B	582			582	
Evaporator Feed Tank - 106 B	448		201	247	101
C	727			727	
BX	3,175			3,175	
BY	1,819	10		1,829	6
TOTAL	6,751	10	201	6,560	109
WEST AREA					
T	1,910			1,910	
U	382			382	
TX	936	55		991	727
Evaporator Feed Tank 118 TX	735		17	718	14
TY	---				
TOTAL	3,963	55	17	4,001	741

* Reserve Capacity at 2,800 gallons per batch
( ) Not included in totals.

TANKS:

~~SECRET~~

DECLASSIFIED

H-2902.04-X 4-52

~~RESTRICTED SECURITY INFORMATION~~

HW-27840

6

~~RESTRICTED~~ SECRET ~~SECURITY INFORMATION~~

BEST AVAILABLE COPY

DECLASSIFIED

WASTE STORAGE STATUS

As of 10-31-52

SECOND CYCLE WASTES

	Cascade In Use	Gallons x 10^3 Cribbed	Sludge	Estimated Reserve Capacity In Batches
EAST AREA	110-111-112-B	82	414	3,020 **
WEST AREA	110-111-112-T	162	725	2,344 ***
TOTAL		244	1,139	5,364

REMARKS: 98,000 gallons from Section 5, 221-B and 114,000 gallons from Section 5, 221-T included in cribbed figures.

** Reserve calculations based on storage of combined 5-6 and second cycle only at 275 gallons of sludge per run.

*** Reserve calculations based on storage of combined 5-6, second cycle and 224-T wastes at 350 gallons of sludge per run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10^3 Cribbed	Sludge	Estimated Reserve Capacity In Batches
EAST AREA	204-203-202-B	[illegible]	170	476
WEST AREA	204-201-T 110-111-112-T	Inactive Cascade 98	187 Included with 2nd	--- cycle figures
TOTAL		140	357	476

REMARKS:

SECRET DECLASSIFIED

H-2902.05-X 4-52

~~RESTRICTED~~ ~~SECURITY INFORMATION~~

HW-27[illegible]

7

~~SECRET~~

~~RESTRICTED SECURITY INFORMATION~~

WASTE STORAGE STATUS

BEST AVAILABLE COPY

DECLASSIFIED

as of 10-31-52

TBP WASTE

[illegible]	Gallons x 10^3			
	In Storage Beg. Mo.	TBP Waste Received	In Storage End Mo.	[illegible] Capacity
[illegible]				
[illegible]				
[illegible]				2,443
[illegible]				
[illegible]		(55) (1)		414
TOTAL				2,857
[illegible]				
[illegible]				1,263
[illegible]				216
[illegible]	380		380	
[illegible]				3,110
TOTAL	380		380	4,589

[illegible] tanks 109 BY and 115 TX not included in the above.

Gallons x 10^3 of condensate to crib 854 (2) (3)

Tailings - Feed to Waste

During Month ---

Cumulative to date ---

Feed adjusted to metal waste equivalent

REMARKS: (1) Stored in unprocessed metal waste tanks 111-112 BY; this material will be re-worked. Shown as metal waste figures; includes 0.61 tons of depleted uranium.

(2) Includes amount cribbed to 216-W and 316-W crib - contained 0.84 tons of depleted uranium.

(3) In addition to this figure, 405,000 gallons of solution containing 2.40 tons of depleted uranium were ditched.

~~SECRET~~

DECLASSIFIED

[illegible]2902-06-X 4-52

~~RESTRICTED SECURITY INFORMATION~~

SECRET

RESTRICTED SECURITY INFORMATION

HW-27[illegible]

BEST AVAILABLE COPY

DECLASSIFIED

[illegible] of 10-[illegible]-52

WASTE EVAPORATOR

[illegible]	Gallons x 10^3			
	[illegible]	Bottoms	Condensate To Cribs	[illegible]
[illegible]				
[illegible]	201	64	137	490
[illegible]				
[illegible]				
[illegible]				
TOTAL	201	64	137	490
[illegible]				
[illegible]				
[illegible]				
[illegible]	17	46 (1)	-29 (1)	674
[illegible]				
TOTAL	17	46	-29	674

[illegible] (1) Bottoms figures exceeded feed because of evaporator flushes, hence recovered space or condensate is negative.

REDOX WASTE

[illegible]	Gallons x 10^3			[illegible]
	In Storage [illegible]	Waste [illegible]	In Storage [illegible]	[illegible]
[illegible]	2,429	323	2,752	2,300
[illegible]				
TOTAL	2,429	323	2,752	

Gallons x 10^3 of condensate to crib 300

[illegible] considered [illegible] capacity [illegible]

DECLASSIFIED

Reserve Capacity [illegible] 2,750 gallons per 6-9 equivalent batch

REMARKS: A total of 2,713,000 gallons of storage space immediately available 241-TX and 2[illegible]

RESTRICTED

SECRET

[illegible]-2902.07-X [illegible]

[redacted] HW-27[illegible]

[redacted] ~~SECURITY INFORMATION~~

STATUS OF WASTE FARMS

BEST AVAILABLE COPY :

DECLASSIFIED

	* Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Cap. Gallons x 10^3	Reserve Cap. In Batches	Remarks
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	410	120	EB	
105	EB	530	172	358	EB	
106	1C	530	247	283	101	Evaporator feed tank
107	EB	530	525	5	EB	Active bottoms tank-East Area Ev[illegible]
108	EB	530	530	---	---	
109	EB	530	518	7	EB	
110	2C	530	530			2nd cycle and 5-6 waste, B Pl[illegible] Active cascade
111	2C	530	530			
112	2C	542	542			112-B cascades to crib
201	224	54.5	54.5			Active cascade, 224-B
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
C Farm						
101	[illegible]	530	530			Cascade now slurrying for TBP [illegible]
102	MW	530	[illegible]			
103	[illegible]	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	1C	530	399	131	TBP	
108	1C	530	34	496	TBP	
109	1C	530	10	515	TBP	Temporary supernate tank for C-Farm operations
110	[illegible]	530	231	299	TBP	Active cascade TBP operations
111	[illegible]	530	36	494	TBP	
112	1C	530	17	506	TBP	
201	MW	54.5	52.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	54.5			

DECLASSIFIED

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

[redacted]

H-2902.08-X 4-52

[redacted] ~~SECURITY INFORMATION~~

HW-27[illegible]

~~SECRET~~

~~RESTRICTED~~ SECURITY INFORMATION

DECLASSIFIED

	Type of Waste*	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	530			
108	1C	530	530			
109	1C	530	530			
110	1C	530	530			
111	1C	530	525			
112	1C	530	530			
B[illegible] Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	[illegible]	83	31	
104	MW	758	758			
105	MW	758	491	267	99	
106	MW	758	---	[illegible]	[illegible]	
107	1C	758	[illegible]	[illegible]	[illegible]	Pumping to 100-B not complete
108	1C	758	[illegible]			
109	TBP	758	---	758		TBP supernate tank - 20C E Area
110	1C	758	732	21	8	Abandoned as 1st cycle cascade
111	MW	758	[illegible]	---	---	
112	[illegible]	758	[illegible]	[illegible]	[illegible]	Abandoned by [illegible] as metal waste cascade. Waste will be cribbed.
T Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			1 year decay complete 3/31/53
105	1C	530	530			Evaporation scheduled to
106	1C	530	528			start 4/1/53
107	1C	530	245	285	[illegible]	
108	1C	530	73	457	[illegible]	
109	[illegible]	530	4	515	[illegible]	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

~~SECRET~~

DECLASSIFIED

H-2902.09-X 4-52

~~RESTRICTED~~ SECURITY INFORMATION

HN-278

~~RESTRICTED~~ ~~SECURITY INFORMATION~~

STATUS OF WASTE FARMS

BEST AVAILABLE COPY

DECLASSIFIED

	Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
T Farm						
110	224 & 2C	530	530			Active cascade-T Plant, 2nd
111	224 & 2C	530	530			cycle, 224 & Sect. 5 wastes.
112	224 & 2C	569	569			Tank 112-T cascades to crib.
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						
101	MW	530	530			Cascade now slurrying for feed
102	MW	530	530			to TBP
103	MW	530	519			
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	[illegible]	[illegible]	[illegible]	Cascade being held as Redox
111	1C	530	14	516	18[illegible]	waste reserve
112	1C	530	[illegible]	[illegible]	[illegible]	
201	TBP	54.5		[illegible]	TBP	
202	TBP	54.5		[illegible]	TBP	
203	TBP	54.5		[illegible]	TBP	
204	TBP	54.5		[illegible]	TBP	
TX Farm						
101	[illegible]	758	[illegible]			
102	[illegible]	758	[illegible]			
103	[illegible]	758	[illegible]			
104	[illegible]	758	[illegible]			
105	MW	758	[illegible]	[illegible]	[illegible]	Overflow to 106-TX plugged at
106	MW	758	10[illegible]	[illegible]	[illegible]	month end
107	MW	758	7[illegible]8	[illegible]	[illegible]	Supernate temp. - 213° F,
108	MW	758	732	[illegible]	[illegible]	10-31-52
109	1C	758	758	---	---	Active cascade, 221-T, 1st [illegible]
110	1C	758	233	525	100	
111	1C	758	---	[illegible]	271	
112	1C	758	---	753	269	

- MW - Metal Waste
- 1C - First Cycle Waste
- 2C - Second Cycle
- R - Redox Waste
- 224 - 224 Bldg. Waste
- TBP - TBP Waste

DECLASSIFIED

~~SECRET~~

~~RESTRICTED~~ ~~SECURITY INFORMATION~~

H-2902,10-X [illegible]-52

[redacted] SECURITY INFORMATION

HW-278

BEST AVAILABLE COPY

DECLASSIFIED

STATUS OF WASTE FARMS

	* Type of Waste	Gallons x 10³		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10³	In Batches	
TX Farm (cont'd)						
113	EB	758	750	8	EB	
114	MW	758	666	81	30	
115	TBP	758	758			TBP supernate tank, 2-West Ar
116	EB	758	92	606	EB	Active bottoms tank, 2-West A
117	EB	758	756			
118	1C	758	718	40	14	Evap. feed tank, 2-West Area
TY Farm						
101	R	758	---	758	276 **	
102	R	758	---	747	272	
103	TBP	758	---	758	---	
104	TBP	758	---	747	---	
105	TBP	758	---	758	---	
106	TBP	758	---	747	---	
S Farm						
101	R	758	---	758	276 **	
102	R	758	---	758	276	
103	R	758	---	747	272	
104	R	758	---	758	276	
105	R	758	---	758	276	
106	R	758	---	747	272	
107	R	758	763	---	---	Filled 10-30-52
108	R	758	17	741	[illegible]	Active tank, Redox Wastes
109	R	758	---	747	[illegible]	
110	R	758	774			
111	R	758	735			
112	R	758	[illegible]	305	[illegible]	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

** - Reserve figures for storage in tank farm 241 and tanks 241-U-110-112; 241-TY-101-102. B on average plant performance of 2,750 gall per batch.

H-2902.11-X 4-52

~~SECRET~~

[redacted] SECURITY INFORMATION

DECLASSIFIED

SECRET

DECLASSIFIED HW-279[illegible]

(13)

WASTE STATUS SUMMARY

RESTRICTED

SECURITY INFORMATION

Month of November 1952

	B Plant	T Plant
Runs of Metal Waste to waste tank during the month	---	25[illegible]
Gals. increase in Metal Waste volume	---	82,2[illegible]0
Gals/Run average Metal Waste volume	---	3,5[illegible]
Reserve Gals. available for Metal Waste on 11-30-52	1,556,000 (1)	652,000
Runs of First Cycle Waste sent to farm during the month	---	25
Gals. increase in First Cycle Waste volume	---	63,250
Gals/Run average First Cycle Waste volume		2,530
Reserve Gals. available for First Cycle Waste on 11-30-52	386,000 (1)	2,013,000

Remarks (1) Reserve space no longer required for B-Plant since all wastes from buildings are being cribbed.

	S Plant
Bismuth Phosphate Batch Equivalent	182.73
Gallons increase in fission product waste storage	473,000
Tons of Uranium (as charged), processed, to contribute to make-up of waste	114.10
Gallons/batch equivalent to 6-3 TS	2,589
Gallons per ton of Uranium processed	4,145
Reserve Gallons available for Redox waste on 11-30-52	(1) 5,846,000

Remarks (1) These reserves are those in tank farm 241-S only.

SECURITY INFORMATION

DECLASSIFIED

RESTRICTED

SECRET

BEST AVAILABLE COPY

H-2902.01-X 5-52

[redacted]

HW-278

14

DECLASSIFIED

Waste Storage Status

[redacted] as of 11-30-52

Total Waste

~~SECURITY INFORMATION~~

Gallons x 10³

FARM	In Storage Prev. Mo.	Metal Waste Received	In Storage End Mo.	Balance Capacity in Batches*
EAST AREA				
B	1,579		1,579	
C	3,374		3,374 (1)	
BX	3,117		3,117	23
BY	4,538	---	4,538	553
TOTAL	12,608	---	12,608	576
WEST AREA				
T	1,579		1,579	
U	4,737		4,737 (1)	
TX	6,078	82	6,160	241
TY	---		---	
TOTAL	12,394	82	12,476	241

REMARKS: *Reserve capacity at 2,700 Gallons per batch

(1) Cascades 101-103 C and 101-103 U are now serving as feed tanks to TBP Plant. These cascades will be indicated as full until the entire cascade has been released.

[redacted]

~~SECURITY INFORMATION~~

H-2902.02-X 4-52

[redacted]

DECLASSIFIED

BEST AVAILABLE COPY

HW-278[illegible]

(15)

DECLASSIFIED

[illegible]

[illegible] 11-30-52

[illegible]

[illegible] INFORMATION

[illegible]	[illegible] Storage [illegible]	[illegible]	[illegible] TBP	[illegible] Storage End [illegible]
[illegible]				
[illegible]	383			383
[illegible]	446.32 (2)	3.40 (1)		449.72
[illegible]	758			758
[illegible]	1,058.37			1,058.37
TOTAL	2,645.92	3.40		2649.09
[illegible]				
[illegible]	374			374
[illegible]	770.45 (2)	[illegible] (1)		773.35
[illegible]	1,395.25	16.27		1,411.52
TY	---			---
TOTAL	2,539.70	19.27		2558.97

* Tons of [illegible] to the [illegible] Removal Group for slurrying

REMARKS: (1) 6.30 tons addition to farm at blend tanks in form of recovered nitric acid. This uranium will be fed back through the TBP Plant.

(2) 392 tons in cascade 101-103 C and [illegible] tons in cascade 101-103 U are now being fed to TBP Plant. These quantities are not included in the above figures.

SECURITY [illegible]

[illegible]

[illegible]

[illegible]

BEST AVAILABLE COPY

DECLASSIFIED

BEST AVAILABLE COPY

HW-27840

T6

[illegible]

DECLASSIFIED

11-30-52

[illegible] AND COATING WASTES
T AND B PLANTS

[illegible]	In Storage Beg. Mo.	[illegible]	Sent to Evaporator	In Storage End Mo.	Storage [illegible]
EAST AREA					
B	582			582	
Evaporator Feed Tank to 106 B	247		82	165	130
[illegible]	727			727	
BX	3,175			3,175	
BY	1,829	---		1,829	8
TOTAL	6,560	---	82	6,478	138
WEST AREA					
T	1,910			1,910	
U	382			382	
TX	991	63		1,054	705
Evaporator Feed Tank [illegible] TX	718		---	718	14
TY	---			---	
TOTAL	4,001	63	---	4,064	719

* [illegible] 2,000 [illegible]
( ) Not included [illegible]

REMARKS:

DECLASSIFIED

BEST AVAILABLE COPY

HW-27840

17

[redacted]

WASTE STORAGE STATUS

DECLASSIFIED

as of 11-30-52

[redacted]

SECOND CYCLE WASTES

SECURITY INFORMATION

	[illegible]	[illegible]	[illegible]	Estimated Reserve Capacity [illegible]
EAST AREA	110-111-112 B	131 (1)	414	3,020 **
WEST AREA	110-111-112 T	178	733	2,321 ***
TOTAL		309	1,147	5,341

REMARKS: (1) Includes metal waste, first cycle, section five, and second cycle wastes resulting from cleanouts.

** Reserve calculations based on storage of combined 5-6 and second cycle only at 275 gallons of sludge per run.

*** Reserve calculations based on storage of combined 5-6, 2nd cycle and 224-T wastes at 360 gallons of sludge per run.

224 BUILDING WASTES

	[illegible]	Gallons x 10³		Estimated Reserve Capacity in [illegible]
		[illegible]	Sludge	
EAST AREA	204-203-202 B	24	170	476
WEST AREA	204-201-T 110-111-112 T	79 Inactive cascade	187 Incl. with 2nd cycle figures	---
TOTAL		103	357	476

REMARKS:

SECURITY INFORMATION

[redacted]

[redacted]

[illegible] -52

DECLASSIFIED

BEST AVAILABLE COPY

HW-27842

[redacted]

WASTE STORAGE STATUS

DECLASSIFIED

As of 11-30-52

[redacted]

FARM	In Storage Beg. Mo.	TBP WASTE [redacted]	In Storage [redacted]	Reserve Capacity
		Gallons x 10^3		
EAST AREA				
B				
C		362	362	1,500 (3)
BX				
BY	55 (1)		55	414
TOTAL	55	362	417	1,974
WEST AREA				
T		426	426	831
U				
TX	380 (2)		380	
TY				3,010
TOTAL	380	426	806	3,841

Supernate tanks, 109 BY and 115 TY not included in the above

Gallons x 10^3 of condensate to crib 2,055

Ratio: ~~*Feed to Waste~~ WASTE TO FEED

During Month 0.95

Cumulative to date 1.65 (4)

* Feed adjusted to metal waste equivalent

REMARKS: (1) High waste in metal waste cascade 111-112 BY - reworkable.

(2) High wast[redacted]

(3) Tank 109 C not included as reserve space since this space is not immediately available.

(4) Includes high wast[redacted]

H-2902.06-X 4-52

[redacted]

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

HW-27848

19

WASTE STORAGE STATUS

[redacted] DECLASSIFIED

As of 11-30-52

WASTE EVAPORATOR

FARM	Gallons x 10^3 Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
EAST AREA				
B	82.5	20	62.5	489
C				
BX				
BY				
TOTAL	82.5	20	62.5	489
WEST AREA				
T				
U				
TX	0	0	0	670 (1)
TY				
TOTAL	0	0	0	670 (1)

REMARKS: (1) 2,000 gallon reserve increase in 113 TX because of volume contraction of liquid following cooling below boiling point toward atmospheric temperature.

REDOX WASTE

FARM	Gallons x 10^3 In Storage Beg. Mo.	Waste Received	In Storage End Mo.	Reserve Capacity In Batches
S Farm	2,751	473	3,224	2,245
U Farm				
TOTAL	2,751			2,245

[redacted]

Gallons x 10^3 of Condensate to crib 406

(Will be considered as Redox reserve capacity when empty)

[redacted]

Reserve Capacity of 2,600 gallons [redacted] batch

REMARKS: A total of 2,713,000 gallons of storage space is available in 241-TY and 241-U tank farms.

DECLASSIFIED

H-2902.07-X 4-52

STATUS OF WASTE FARMS

HW-27840

	* Type of Waste	Gallons x 10^3 Capacity	[redacted]	Reserve Cap. [redacted]	[redacted]	Remarks
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	410	120	EB	
105	EB	530	172	358	EB	
106	1C	530	165	365	130	Evaporator feed tank
107	EB	530	531	---		Cascaded to 108-B, 11-25-52
108	EB	530	528	---		Cascaded to 109-B, 11-30-52 *
109	EB	530	514	11	EB	
110	1C - 2C-5-6	530	530			Active cascade, B Plant receives
111	1C - 2C-5-6	530	530			flushes of Sec. 5, 1st cycle &
112	1C - 2C-5-6	542	542			2nd cycle lines
201 MW	224	54.5	54.5			Active cascade, B Plant receives
202 MW	224	54.5	54.5			flushes of 224-B Bldg. & MW lines
203 MW	224	54.5	54.5			
204 MW	224	54.5	54.5			
C Farm						
101	MW	530	779			Cascade now serving as feed to
102	MW	530				TBP Plant
103	MW	530				
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	1C	530	399-0	131	TBP	
108	1C	530	24-0	506	TBP	
109	1C-TBP	530	10-486	23	TBP	Temporary supernate tank for
110	1C-TBP	530	231-259	40	TBP	C-Farm MW removal operations 200-E active receiver of TBP
111	1C-TBP	530	36-103	391	TBP	wastes. Overflow 110-C to 111-C
112	1C-TBP	530	17-0	502	TBP	plugged on 11-15-52
201	MW	54.5	52.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	54.5			

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
[redacted] Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

* Tanks 108 and 109-B were previously in service for storage of eva[redacted] bottoms in May and August respectively. Since tho[redacted] bottoms solutions have cooled, causing a densi[redacted]se. This has resulted in 19,000 gallons of additional storage space, which was utilized by cascading wastes from 107-B to 108-B to 109-B in November.

H-2902.08-X 4-52

BEST AVAILABLE COPY

[redacted]

HW-27811

21

DECLASSIFIED

STATUS OF WASTE FAR[redacted]

	* Type of Waste	Gallons x 10^3		[redacted] x 10^3	[redacted] In Batches	Remarks
		Capacity	Stored			
BX Farm						
101	MW	530	530 [redacted]			
102	MW	530	467	[redacted]	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C	530	530			
108	1C	530	530			
109	1C	530	530			
110	1C	530	530			
111	1C	530	525			
112	1C	530	530			
BY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	644	83	31	
104	MW	758	758			
105	MW	758	491	267	99	
106	MW	758	---	747	277	
107	1C	758	344	414	TBP	No supernate pumped to 106-B in November
108	1C	758	753			
109	TBP	758	---	758		TBP supernate tank, 200 E Area
110	1C	758	732	21	8	
111	MW	758	758	---		
112	MW	758	351	396	147	
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			[redacted] decay complete 3/31/53
105	1C	530	[redacted]			[redacted]tion scheduled to start
106	1C	530	[redacted]			4-1-53
107	1C-TBP	530	245-285	---	TBP	Full 11-20-52. Started filling with TBP, 11-17-52, because of
108	1C-TBP	530	73-141	316	TBP	plug in 110-111-112 C cascade
109	1C-TBP	530	[redacted]		TBP	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

H-2902 09-X 4-52

[redacted]

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

HW-27840

DECLASSIFIED

STATUS OF WASTE FARMS

	*Type of Waste	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Capacity Gallons x 10^3	Reserve Capacity In Batches	Remarks
T Farm						
110	224&2C	530	530	[redacted]		2nd cycle, Sec. 5, and 224 Bldg.
111	224&2C	530	530			Active cascade, T Plant
112	224&2C	569	569			Tank 112. T cascades to crib
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	[redacted]			
U Farm						
101	MW	530	586			Cascade now serving as feed to TBP Plant
102	MW	530				
103	MW	530				
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	530			
110	1C	530	336	194	75 **	Cascade being held as Redox waste reserve
111	1C	530	14	516	198	
112	1C	530	32	498	192	
201	TBP	54.5		52.5	TBP	
202	TBP	54.5		54.5	TBP	
203	TBP	54.5		54.5	TBP	
204	TBP	54.5		54.5	TBP	
TX Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	750			
105	MW	758	766	---	---	Plug removed 11-8-52
106	MW	758	187	571	211	
107	MW	758	766	---	---	
108	MW	758	751	---	---	
109	1C	758	758	[redacted]		Active cascade, 221-T, 1st cycle
110	1C	758	296			
111	1C	758	---			
112	1C	758	---	753	269	

* MW - Metal Waste
* 1C - First Cycle Waste
2C - Second Cycle
R - Redox Waste

224 = 224 Bldg. Waste
TBP = TBP Waste
EB - Evaporator Bottoms
** See bottom of page H-2902.11-X

[redacted]

DECLASSIFIED

H-2902.10-X 4-52

BEST AVAILABLE COPY

~~SECRET~~

HW-278[illegible]

23

STATUS OF WASTE FARMS

DECLASSIFIED

~~RESTRICTED~~

	* Type of Waste	Gallons x 10^3		Re[illegible]		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
TX Farm (cont'd)						
113	EB	758	748	10	EB	
114	MW	758	666	[illegible]	[illegible]	
115	TBP	758	7[illegible]	[illegible]	[illegible]	TBP supernate tank, 200-W Area
116	EB	758	92	666	EB	Active bottoms tank, 200-W Evap.
117	EB	758	756			
118	1C	758	718	40	14	Evap. feed tank, 200-W Area
TY Farm						
101	R	758	---	758	291 **	
102	R	758	---	747	287	
103	TBP	758	---	758	TBP	
104	TBP	758	---	747	TBP	
105	TBP	758	---	758	TBP	
106	TBP	758	---	747	TBP	
[illegible] Farm						
101	R	758	---	758	291 **	
102	R	758	---	758	291	
103	R	758	---	747	287	
104	R	758	---	758	291	
105	R	758	---	758	291	
106	R	758	---	747	287	
107	R	758	763		---	
108	R	758	490	268	103	Active tank, Redox wastes
109	R	758	---	747	287	
110	R	758	274			
111	R	758	755			
112	R	758	442	305	117	

* MW = Metal Waste
1C = First Cycle Waste
2C = Second Cycle Waste
R - Redox Waste

224 = 224 Bldg. Waste
TBP = TBP Waste
EB = Evaporator Bottoms

~~SECURITY INFORMATION~~

** [illegible] performance of 2,600 gallons per batch (average of Oct.-Nov. 1952)

H-2902.11-X 4-52

~~RESTRICTED~~ ~~SECRET~~

DECLASSIFIED

[redacted]

HW-278

(24)

WASTE STATUS SUMMARY

BEST AVAILABLE COPY

DECLASSIFIED

Month of December, 1952

	B Plant	T Plant
Runs of Metal Waste to waste farm during the month	—	41
Gals. increase in Metal Waste volume	(1)	104,500
Gals./Run average Metal Waste volume	—	2,549
Reserve Gals. available for Metal Waste on 12-31-52	1,545,000 (2)	547,000
Runs of First Cycle Waste sent to farm during the month	—	39
Gals. increase in First Cycle Waste volume	(1)	101,750
Gals./Run average First Cycle Waste volume	—	2,609
Reserve Gals. available for First Cycle Waste on 12-31-52	(3) 136,000	(3) 1,911,000

Remarks: (1) All wastes from B Plant are cribbed after passing through either the 200-B series tanks, or 110-112-B cascade. (See 2nd cycle and 224 wastes) (2) Decreased 11,000 gallons below previous month figure, because of addition of temporary TBP waste to 111-112-BX tanks. (3) Includes empty space in first cycle evaporator feed tanks.

	S Plant
Bismuth Phosphate Batch Equivalent	140.69
Gallons increase in Fission product waste storage	372,000
Tons of Uranium (as charged) processed to contribute to make-up of waste	91.00
Gallons/batch equivalent to 603 TS	2,650
Gallons per ton of Uranium processed	(1) 4,096
Reserve Gallons available for Redox waste on 12-31-52	(2) 5,475,000

Remarks: (1) Minor process changes were made which tend toward reducing waste volume per ton of uranium feed by a small percentage. (2) These reserves are those in tank farm 241-S only.

DECLASSIFIED

H-2902.01-X 3-52

[redacted]

[redacted]

HW-2781

25

DECLASSIFIED

WASTE STORAGE STATUS

As of 12-31-52

METAL WASTE

* FARM	Gallons x 10³ In Storage Beg. Mo.	Metal Waste Received	In Storage End Mo.	Reserve Capacity In Batches
EAST AREA				
B	1,579		1,579	
C	3,374 (1)		3,374	
BX	3,117		3,117	23
BY	4,538	11 (2)	4,549	550
TOTAL	12,608	11	12,619	573
WEST AREA				
T	1,579		1,579	
U	4,737 (1)		4,737	
TX	6,160	105	6,265	203
TY				
TOTAL	12,476	105	12,581	203

REMARKS: *Reserve capacity at 2,700 Gallons per batch

(1) Cascades 101-103-C and 101-103-U are now serving as feed tanks to TBP Plant. These cascades will be indicated as full until the entire cascade has been released.

(2) High waste from TBP Plant return to metal waste storage.

BEST AVAILABLE COPY

[redacted]

H-2.400.00-X 4-52

[redacted]

DECLASSIFIED

HW - 278

26

[redacted]

WASTE STORAGE STATUS

DECLASSIFIED

of - —-31-52

URANIUM CONTENT
METAL WASTE

FARM	TONS OF DEPLETED URANIUM			
	In Storage Prev. Mo.	Received	* To TBP	In Storage End Mo.
EAST AREA				
B	383			383
C	(2) 449.72	1.35 (3)		451.07
BX	758			758
BY	1,058.37	0.67 (1)		1,059.04
TOTAL	2,649.09	2.02		2,651.11
WEST AREA				
T	374			374
U	(2) 773.35	1.37 (3)		774.72
TX	1,411.52	24.58		1,436.10
TY				
TOTAL	2,558.87	25.95		2,584.82

* Tons of uranium transferred as metal waste to the Waste Removal Group for slurrying.

REMARKS: (1) 0.67 tons of high TBP waste sent to cascade 111-112-BY

(2) 392 tons in cascade 101-103-C and 405 tons in cascade 101-103-U are now being fed to TBP Plant. These quantities are not included in the above total.

(3) 2.72 tons of uranium returned to tank farm blend tanks in form of recovered nitric acid.

BEST AVAILABLE COPY

[redacted]

H-2902.03-X 4-52 [redacted]

DECLASSIFIED

[redacted]

HW-27[illegible]

27

DECLASSIFIED

WASTE STORAGE STATUS

As of 12-31-52

FIRST CYCLE WASTE AND COATING WASTE

T AND B PLANTS

FARM	Gallons x 10^3				Reserve Ca[illegible] In Batches
	In Storage Beg. Mo.	1st Cycle Waste Rec'd	Feed To Evaporator	In Storage End Mo.	
EAST AREA					
B (1)	2,155	(197)		2,352	
Evaporator Feed Tank - 106 B	165		(250)	415	41
C (2)	727			727	
BX	3,175		(23) (3) 579	2,573	
BY	1,829		343	1,486	8
TOTAL	8,051	(197)	672 (23)	7,553	49
WEST AREA					
T	1,910			1,910	
[illegible] (2)	382			382	
TX	3,316	102		3,418	669
Evaporator (1) Feed Tank - 118 TX	718			718	14
TY					
TOTAL	6,326	102		6,428	683

* Reserve Capacity of 2,800 gallons per Batch

( ) Not included in totals

REMARKS: All figures have been revised to include first cycle wastes in storage as evaporator bottoms. (1) Figures represent bottoms storage only. (2) First cycle waste as non-evaporable sludge only. (3) 23,000 gallons of first cycle waste lost to ground during pumping of 106 BX supernatant liquid to 106-B evaporator feed tank on 12-16-52.

BEST AVAILABLE COPY

H-2902.04-X 4-52

[redacted]

S[redacted]T

DECLASSIFIED

[redacted]

HW-27848

(28)

[redacted]

DECLASSIFIED

WASTE STORAGE STATUS

As of 12-31-52

SECOND CYCLE WASTES

	Cascade In Use	Gallons x 10^3 Cribbed	Gallons x 10^3 Sludge	Estimated Reserve Capacity In Batches
EAST AREA	110-111-112-B	97 (1)	414	3,020
WEST AREA	110-111-112-T	218	734	2,28[illegible]
TOTAL		315	1,148	5,302

REMARKS: (1) Includes metal waste, first cycle, section five, and second cycle wastes resulting from cleanouts. ** Reserve calculations based on storage of combined section five and second cycle wastes only at 275 gal. of sludge per run. *** Reserve calculations based on storage of combined section five, second cycle, and 224-T building waste at 350 gal. of sludge per run.

224 BUILDING WASTES

	Cascade In Use	Gallons x 10^3 Cribbed	Gallons x 10^3 Sludge	Estimated Reserve Capacity In Batches
EAST AREA	201-203-202-B	13 (2)	170	476
WEST AREA	204-201-T 110-111-112-T	Inactive Cascade 132	187 Included with 2nd cycle figures	
TOTAL		145	357	476

REMARKS: Flushes of B plant are cribbed as follows: (1) 2nd cycle, 1st cycle, stack drainage, and section 5 crib via 110-111-112-B tanks. (2) 224-B and Section 9 metal waste tanks crib via 200-B tanks.

[redacted]

[redacted]

BEST AVAILABLE COPY

H-2902.05-X 4-52

DECLASSIFIED

[redacted]

HW-278

DECLASSIFIED

WASTE STORAGE STATUS

As of 12-31-52

TBP WASTE

PERMANENT AND TEMPORARY WASTE

TANK	In Storage Beg. Mo. Perm.	In Storage Beg. Mo. Temp.	TBP Received Perm.	TBP Received Temp.	In Storage End Mo. Perm.	In Storage End Mo. Temp.	Reserve Capacity Perm.	Reserve Capacity Temp.
	Gallons x 10^3							
EAST AREA								
B		(1)		(1)		(1)		(1)
C	362		198		560		1,362 (4)	
BX							602	
BY		55		11		66	757	
TOTAL	362	55	198		560	66	2,721	
WEST AREA								
T	426		774				57	
U							216	
TX		9 (1) 371 (2)				9 (1) 371 (2)		
TY							1,010	
TOTAL	426	380	774	0	1,200	380	3,283	

Supernate tanks, 109 BY and 115 TX not included in the above.

Gallons x 10^3 of condensate to crib 1,909 (3)

Volumetric Ratios:

	Waste to Feed (Permanent only)	(Combined Perm. and Temp.)
During Month	1.90	1.93
Cumulative to date	1.17	1.47

* Feed adjusted to metal waste equivalent

REMARKS: (1) Temporary wastes and reserve capacities are shown with metal waste inventories. (2) Temporary waste stored in 115 TX supernate tank. (3) Cribbed waste contained 1.62 tons of depleted and decontaminated uranium. (4) Tank 109-C is not included in reserve figure since this space is not immediately available.

DECLASSIFIED

[redacted]

H-2902.06-X 4-52

BEST AVAILABLE COPY

[redacted]

HW-278

30

WASTE STORAGE STATUS

As of 12-31-52

WASTE EVAPORATOR

FARM	Gallons x 10^3			
	Feed	Bottoms	Condensate To Cribs	Reserve Bottoms Space
[illegible]				
B		197	475	303
[illegible]				
BX	329			
BY	343			
TOTAL	672	197	475	(1) 303
[illegible]				
T				
[illegible]				
TX	———	———	———	676
TY				
TOTAL	———	———	———	676

On the basis of present bottoms reserves figures, it is estimated that a re-evaporation of evaporator bottoms tanks will be required near the middle of February, 1953 before further space recovery can be made.

REMARKS:

REDOX WASTE

FARM	Gallons x 10^3			**
	In Storage Beg. Mo.	Waste Received	In Storage End Mo.	Reserve Capacity In Batches
S Farm	3,224	373	3,597	2,103
*U Farm				
TOTAL	3,224	373	3,597	2,103

Gallons x 10^3 of condensate to crib 37[illegible].

* Will be considered as Redox reserve capacity when empty.

[redacted]

** Reserve Capacity at 2,600 gallons per 6-3 equivalent batch

REMARKS: A total of 2,713,000 gallons of storage space is available in 241-TY and 241-U tank farms.

H-2902.07-X 4-52

HW-27C

31

BEST AVAILABLE COPY

S[redacted]

[redacted]

STATUS OF WASTE FARMS

DECLASSIFIED

	Type of Waste*	Gallons x 10^3 Capacity	Gallons x 10^3 Stored	Reserve Cap. Gallons x 10^3	Reserve Cap. In Batches	Remarks
B Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	EB	530	531			Started filling 12-4-52:
105	EB	530	227	303	EB	
106	1C	530	415	115	41	Evaporator Feed Tank
107	EB	530	531			
108	EB	530	528			
109	EB	530	535			Completed filling 12-4-52
110 1C-2C	5-6	530	530			Active Cascade - B Plant
111 1C-2C	5-6	530	530			
112 1C-2C	5-6	542	542			
201 MW	224	54.5	54.5			Active Cascade - B Plant
202 MW	224	54.5	54.5			
203 MW	224	54.5	54.5			
204 MW	224	54.5	54.5			
C Farm						
101	MW	530				Cascade now processing for feed
102	MW	530	984	595		to TBP Plant
103	MW	530				
104	MW	530	530			
105	MW	530	530			
106	MW	530	519			
107	1C-TBP	530	399-148	(-16)		Overflow line to 108 C plugged
108	1C-TBP	530	34-51	445	TBP	/12-18-52
109	1C-TBP	530	10-486	23	supernate	Temp. supernate tank for C-farm MW removal operations
110	1C-TBP	530	231-259	40	TBP	Overline still plugged 12-31-52
111	1C-TBP	530	36-103	391	TBP	
112	1C-TBP	530	17-0	502	TBP	
201	MW	54.5	52.5			
202	MW	54.5	54.5			
203	MW	54.5	54.5			
204	MW	54.5	54.5			

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redex Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

S[redacted]

DECLASSIFIED

H-2902.08-X 4-52

[redacted]

[redacted]

BEST AVAILABLE COPY

HW-278

32

[redacted] SECURITY INFORMATION

DECLASSIFIED

STATUS OF WASTE FARMS

	*Type of Waste	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
BX Farm						
101	MW	530	530			
102	MW	530	467	63	23	
103	MW	530	530			
104	MW	530	530			
105	MW	530	530			
106	MW	530	530			
107	1C-TBP	530	437-0	93	TBP	Finished pumping 12-18-52, down to
108	1C-TBP	530	21-0	509	TBP	sludge. Finished pumping to 11,00[illegible]
109	1C-TBP	530	530			heal, 1-1-52. 23,000 gallons af[illegible]
						1st cycle supernate was lost to th[illegible]
110	1C	530	530			open ground from 108 BX pumping
111	1C	530	523			operation on 12-16-52.
112	1C	530	530			
BY Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	664	83	31	
104	MW	758	758			
105	MW	758	491	267	99	
106	MW	758		747	277	
107	1C-TBP	758	1	757	TBP	Pumped to liquid heel - 12-6-52
108	1C	758	753			
109	TBP	758		758	Supernate	TBP supernate tank - 200-E Area
110	1C	758	732	22	8	
111	1C	758	758			Receives high TBP wastes for temp-
112	MW	758	362	385	143	orary storage.
						(Received 11,000 gallons in Dec.)
C Farm						
101	MW	530	530			
102	MW	530	530			
103	MW	530	519			
104	1C	530	530			1 yr. decay complete 3-31-53
105	1C	530	530			Evaporation to start after 4-1-53
106	1C	530	529			
107	1C-TBP	530	245-285			
108	1C-TBP	530	73-457			Tank filled 12-11-52
109	1C-TBP	530	4-458	57	TBP	Tank now filling with TBP waste.

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redox Waste
224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms

[redacted]

DECLASSIFIED

H-2902.09-X.4-52

BEST AVAILABLE COPY

HW-27

[redacted]

DECLASSIFIED

STATUS OF WASTE FARMS

	*Type of Waste	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
T Farm						
110 5-6	224/A2C	530	530			Active cascade - T Pl...
111 5-6	224/A2C	530	530			
112 5-6	224/A2C	569	569			112-T Cascades to ...
201	224	54.5	54.5			
202	224	54.5	54.5			
203	224	54.5	54.5			
204	224	54.5	54.5			
U Farm						
101	MW	530				Cascade now serving as feed to TBP Plant
102	MW	530	797	782		
103	MW	530				
104	MW	530	296	234		Supernate from 104-U pumped to Cascade 101-103U
105	MW	530	530			
106	MW	530	519			
107	MW	530	530			
108	MW	530	530			
109	MW	530	519			
110	1C	530	336	194	75**	Cascade being held as Redox waste reserve.
111	1C	530	14	516	198	
112	1C	530	32	498	192	
201	TBP	54.5		52.5	TBP	
202	TBP	54.5		54.5	TBP	
203	TBP	54.5		54.5	TBP	
204	TBP	54.5		54.5	TBP	
TX Farm						
101	MW	758	758			
102	MW	758	758			
103	MW	758	758			
104	MW	758	750			
105	MW	758	766			
106	MW	758	292	466	173	Active cascade 221-T Metal Waste
107	MW	758	766			
108	MW	758	751			
109	1C	758	758			Active cascade 221-T - 1st Cycle
110	1C	758	398	360	129	
111	1C	758		758	272	
112	1C	758		753	269	Tank to be held for Recuplex waste

* MW - Metal Waste
* 1C - First Cycle Waste
2C - Second Cycle
R - Redox Waste
224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms
* See bottom of page H-2902.11-I

H-2902.10-X 4-52

[redacted]

DECLASSIFIED

BEST AVAILABLE COPY

[redacted]

HW-27

DECLASSIFIED

STATUS OF WASTE FARMS

	* Type of Waste	Gallons x 10^3		Reserve Capacity		Remarks
		Capacity	Stored	Gallons x 10^3	In Batches	
TX Farm (cont'd)						
113	EB	758	748	10	EB	
114	MW	758	666	81	30	
115	TBP	758	759			TBP supernate tank, 200-W Ar
116	EB	758	92	666	EB	Active bottoms tank, 200-W Ar
117	EB	758	756			
118	1C	758	718	40	14	Evap. feed tank, 200-W Area
TY Farm						
101	R	758		758	291**	
102	R	758		747	287	
103	TBP	758		758	TBP	
104	TBP	758		747	TBP	
105	TBP	758		758	TBP	
106	TBP	758		747	TBP	
S Farm						
101	R	758		758	291**	
102	R	758		758	291	
103	R	758		747	287	
104	R	758		758	291	
105	R	758		758	291	
106	R	758		747	287	
107	R	758	763			
108	R	758	760			Filled 12-24-52; cascaded to
109	R	758	103	644	248	109-S. Active tank, Redex Wastes.
110	R	758	774			
111	R	758	755			
112	R	758	442	305	117	

* MW - Metal Waste
1C - First Cycle Waste
2C - Second Cycle Waste
R - Redex Waste

224 - 224 Bldg. Waste
TBP - TBP Waste
EB - Evaporator Bottoms
** Based on Plant performance of 2,600 gallons per batch - (average - Oct, Nov., 1952)

H-2902.11-X 4-52 [redacted]

[redacted]

DECLASSIFIED

APPENDIX B

WHC-MR-0132, A HISTORY OF THE 200 AREA TANK FARMS

TANKS 241-B-201 THROUGH 241-B-204

AND

TANKS 241-T-201 THROUGH 241-T-204

Waste Status Summary of 201-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1944					
2					
3					
4					
1-1945					
2					
3					
4					
1-1946					
2					
3					
4					
1-1947					
2					
3					
4					
1-1948					
2					
3					
4					
1-1949					
2					
3					
4					
1-1950					
2					
3					
4					
1-1951					
2					
3					
4					
1-1952	224	54.5	---	---	Active cascade to crib
2	224	54.5	---	---	Active cascade to crib
3	224	54.5	---	---	Active cascade to crib
4	224-MW	54.5	---	---	Active cascade to crib

Waste Status Summary of 201-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1953	224-MW	54.5	---	---	Receives B plant flushes
2	224-MW	54.5	0	54.5	
3	224-MW	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1954	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1955	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1956	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1957	224	53	0	54.5	Latest electrode reading
2	224	53	0	54.5	
3	224	53	24.5	28.5	
4	224	53	24.5	28.5	
1-1958	224	53	24.5	28.5	
2	224	53	24.5	28.5	
3	224	53	29.5	23.5	
4	224	51	22.5	28.5	Latest electrode reading
1-1959	224	51	22.5	28.5	
2	224	51	22.5	28.5	New electrode
3	224	51	22.5	28.5	
4	224	52	0	54.5	
1-1960	224	52	0	54.5	
2	224	52	0	54.5	
3	224	52	0	54.5	
4	224	52	0	54.5	
1-1961	224	---	0	54.5	
2	224	50	0	54.5	
3	224	50	0	54.5	
4	224	50	0	54.5	

Waste Status Summary of 201-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1962	224	50	0	54.5	
2	224	50	0	54.5	
3	224	---	---	---	
4	224	51	1	50	
1-1963	224	51	1	50	
2	224	51	1	50	
3	224	---	---	50	
4	224	53	3	50	Latest electrode reading
1-1964	224	53	3	50	
2	224	53	3	50	
3	224	53	3	50	
4	224	53	3	50	
1-1965	---	---	---	50	
2	224	56	6	50	
3	224	56	6	50	
4	224	56	6	50	
1-1966	224	56	6	50	
2	224	56	6	50	
3	224	56	6	50	
4	224	56	6	50	
1-1967	224	56	6	50	
2	224	56	6	50	
3	224	56	6	50	
4	224	56	6	50	
1-1968	224	55	5	50	
2	224	55	5	50	
3	224	55	5	50	
4	224	55	5	50	
1-1969	224	55	5	50	
2	224	55	5	50	
3	224	55	5	50	
4	224	55	5	50	
1-1970	224	55	25	30	
2	224	55	25	30	
3	224	55	25	30	
4	224	54	24	30	

Waste Status Summary of 201-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1971	224	54	24	30	
2	224	33	3	30	22 to 106-B
3	224	33	3	30	
4	224	33	3	30	
1-1972	224	33	7	26	
2	224	33	7	26	
3	224	33	7	26	
4	224	33	7	26	
1-1973	224	33	7	26	Suspect leaker
2	224	33	7	26	Suspect leaker
3	224	33	7	26	Suspect leaker
4	224	33	7	26	Suspect leaker
1-1974	224	32	6	26	Suspect leaker, 1 to 109-B
2	224	31	5	26	Suspect leaker, 2 to 109-B
3	224	29	3	26	Suspect leaker, 4 to 109-B
4	---	29	0	29	Suspect leaker, 4 water, 6 to 109-B
1-1975	---	29	0	29	Suspect leaker, 2 to 102-B.
2	---	29	0	29	Removed from service, 1 to 109-B
3	---	29	0	29	" " "
4	---	29	0	29	" " "
1-1976	---	29	0	29	" " "
2	---	29	0	29	
3	---	29	0	29	
4	---	29	0	29	Salt Well Comp.
1-1977	---	29	0	29	Questionable Integrity
2	---	29	0	29	
3	---	29	0	29	Inactive-Stabilized
4	---	29	0	29	Inactive Current-Stabilized Phase I

201-B-5 WHC-MR-0132

Waste Status Summary of 201-B Tank-Capacity 530,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	29	0	29	Inactive - Primary Stabilized
2-	-	29	0	29	
3-	-	29	0	29	P-10 Pmp. Removed
4-	-	29	0	29	
1-1979	-	28	1	27	New Solids Level 1/29/79
2-	-	28	1	27	Questionable Integrity
3-	-	28	1	27	
4-	-	28	1	27	
1-1980	-	28	1	27	New Photo 2/4/80
2-	-	28	1	27	
3-	-	29	1	28	
4-	-	29	1	28	

Waste Status Summary of 202-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1944					
2					
3					
4					
1-1945					
2					
3					
4					
1-1946					
2					
3					
4					
1-1947					
2					
3					
4					
1-1948					
2					
3					
4					
1-1949					
2					
3					
4					
1-1950					
2					
3					
4					
1-1951					
2					
3					
4					
1-1952	224	54.5	---	---	Active cascade to crib
2	224	54.5	---	---	Active cascade to crib
3	224	54-5	---	---	Active cascade to crib
4	224-MW	54.5	---	---	Active cascade to crib

Waste Status Summary of 202-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1953	224-MW	54.5	---	---	Receives B plant flushes
2	224-MW	54.5	---	54.5	
3	224-MW	54.5	29.5	25.0	
4	224	54.5	29.5	25.0	
1-1954	224	54.5	29.5	25.0	
2	224	54.5	29.5	25.0	
3	224	54.5	29.5	25.0	Cascades to crib
4	224	54.5	29.5	25.0	Rec'd 5-6 water. Cascades to crib
1-1955	224	54.5	29.5	25.0	
2	224	54.5	29.5	25.0	Cascades to crib
3	224	54.5	29.5	25.0	Rec'd 224-B flush water. Cascades tc crib
4	224	54.5	29.5	25.0	
1-1956	224	54.5	29.5	25.0	
2	224	54.5	29.5	25.0	
3	224	54.5	29.5	25.0	
4	224	54.5	29.5	25.0	
1-1957	224	56	31	25.0	Latest electrode reading
2	224	56	31	25.0	
3	224	56	31	25.0	
4	224	56	31	25.0	
1-1958	224	56	31	25	
2	224	56	31	25	
3	224	56	31	25	
4	224	54	29	25	Latest electrode reading
1-1959	224	54	29	25	
2	224	54	29	25	New electrode
3	224	54	29	25	
4	224	54	29	25	
1-1960	224	54	29	25	
2	224	54	29	25	
3	224	51	26	25	
4	224	51	26	25	
1-1961	224	51	26	25	
2	224	51	26	25	
3	224	51	26	25	
4	224	51	26	25	

Waste Status Summary of 202-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1962	224	---	---	25	
2	224	54.5	29.5	25	7.5 from 221-B
3	224	---	---	25	
4	224	55	30	25	
1-1963	224	55	30	25	
2	224	55	30	25	
3	224	---	---	25	
4	224	54	29	25	Latest electrode reading
1-1964	224	54	29	25	
2	224	54	29	25	
3	224	54	29	25	
4	224	54	29	25	
1-1965	---	---	---	25	
2	224	58	33	25	
3	224	56	31	25	
4	224	56	31	25	
1-1966	224	56	31	25	
2	224	56	31	25	
3	224	56	31	25	
4	224	56	31	25	
1-1967	224	56	31	25	
2	224	56	31	25	
3	224	56	31	25	
4	224	56	31	25	
1-1968	224	56	31	25	
2	224	56	31	25	
3	224	56	31	25	
4	224	56	31	25	
1-1969	224	56	31	25	
2	224	56	31	25	
3	224	56	31	25	
4	224	56	31	25	
1-1970	224	56	27	29	
2	224	56	27	29	
3	224	56	27	29	
4	224	56	27	29	

Waste Status Summary of 202-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1971	224	56	27	29	
2	224	56	27	29	
3	224	56	27	29	
4	224	56	27	29	
1-1972	224	56	29	27	
2	224	56	29	27	
3	224	56	29	27	
4	224	56	29	27	
1-1973	224	56	29	27	
2	224	56	29	27	
3	224	56	29	27	
4	224	56	29	27	
1-1974	224	53	26	27	3 to 109-B
2	224	53	26	27	
3	224	53	26	27	
4	224	53	26	27	
1-1975	224	53	26	27	
2	224	53	26	27	
3	224	53	26	27	
4	224	53	26	27	
1-1976	224	53	26	27	
2	224	53	26	27	
3	---	53	26	27	Restricted
4	---	53	26	27	"
1-1977	---	53	26	27	Restricted
2	---	30	3	27	"
3	---	27	0	27	Inactive Current
4	---	27	0	27	" "

202-B-5 WHC-MR-0132

Waste Status Summary of 202-B Tank-Capacity 530,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	27	0	27	Inactive
2-	-	27	0	27	
3-	-	27	0	27	
4-	-	27	0	27	
1-1979	-	27	0	27	
2-	-	27	0	27	
3-	-	27	0	27	
4-	-	27	0	27	
1-1980	-	27	0	27	New Photo 2/4/80
2-	-	27	0	27	
3-	-	28	0	28	
4-	-	28	0	28	

Waste Status Summary of 203-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1944					
2					
3					
4					
1-1945					
2					
3					
4					
1-1946					
2					
3					
4					
1-1947					
2					
3					
4					
1-1948					
2					
3					
4					
1-1949					
2					
3					
4					
1-1950					
2					
3					
4					
1-1951					
2					
3					
4					
1-1952	224	54.5	---	---	Active cascade to crib
2	224	54.5	---	---	Active cascade to crib
3	224	54.5	---	---	Active cascade to crib
4	224-MW	54.5	---	---	Active cascade to crib

Waste Status Summary of 203-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1953	224-MW	54.5	---	---	Receives B plant flushes
2	224-MW	54.5	0	54.5	
3	224-MW	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1954	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1955	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1956	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1957	224	56	1.5	54.5	Latest electrode reading
2	224	56	1.5	54.5	
3	224	56	1.5	54.5	
4	224	56	1.5	54.5	
1-1958	224	56	1.5	54.5	
2	224	56	1.5	54.5	
3	224	56	1.5	54.5	
4	224	55	0.5	54.5	Latest electrode reading
1-1959	224	55	0.5	54.5	
2	224	55	0.5	54.5	
3	224	55	0.5	54.5	
4	224	55	0.5	54.5	
1-1960	224	55	0.5	54.5	
2	224	55	0.5	54.5	
3	224	55	0.5	54.5	
4	224	55	0.5	54.5	
1-1961	224	---	---	54.5	
2	224	54	0	54.5	
3	224	54	0	54.5	
4	224	54	0	54.5	

Waste Status Summary of 203-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1962	224	---	---	54.5	
2	224	56	1.5	54.5	
3	224	56	---	---	
4	224	56	2	54	
1-1963	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	Latest electrode reading
1-1964	224	---	---	54	
2	224	55	1	54	New electrode
3	224	55	1	54	
4	224	55	1	54	
1-1965	---	---	---	54	
2	224	58	4	54	
3	224	56	2	54	
4	224	56	2	54	
1-1966	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1967	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1968	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1969	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1970	224	56	7	49	
2	224	56	7	49	
3	224	56	7	49	
4	224	56	7	49	

Waste Status Summary of 203-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1971	224	56	7	49	
2	224	56	7	49	
3	224	56	7	49	
4	224	56	7	49	
1-1972	224	56	12	44	
2	224	56	12	44	
3	224	56	12	44	
4	224	56	12	44	
1-1973	224	56	12	44	
2	224	56	12	44	
3	224	56	12	44	
4	224	56	12	44	
1-1974	224	50	6	44	6 to 109-B
2	224	50	6	44	
3	224	50	6	44	
4	224	50	6	44	
1-1975	224	50	6	44	
2	224	50	6	44	
3	224	50	6	44	
4	224	50	6	44	
1-1976	224	50	6	44	
2	224	50	6	44	
3	---	50	5	45	Restricted
4	---	50	5	45	"
1-1977	---	50	5	45	Restricted
2	---	50	5	45	"
3	---	50	3	47	Inactive Current-Solid Level Adj.
4	---	50	3	47	" " " " "

Waste Status Summary of 203-B Tank-Capacity 530,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	50	3	47	Inactive
2-	NCPLX	50	3	47	
3-	NCPLX	50	3	47	
4-	NCPLX	50	3	47	
1-1979	NCPLX	50	3	47	New Photo's 3/1/79
2-	NCPLX	50	3	47	
3-	NCPLX	50	3	47	
4-	NCPLX	50	3	47	
1-1980	NCPLX	50	3	47	New Photo 2/6/80
2-	NCPLX	50	3	47	
3-	NCPLX	50	2	48	
4-	NCPLX	50	2	48	

Waste Status Summary of 204-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1944					
2					
3					
4					
1-1945					
2					
3					
4					
1-1946					
2					
3					
4					
1-1947					
2					
3					
4					
1-1948					
2					
3					
4					
1-1949					
2					
3					
4					
1-1950					
2					
3					
4					
1-1951					
2					
3					
4					
1-1952	224	54.5	---	---	Active cascade to crib
2	224	54.5	---	---	Active cascade to crib
3	224	54.5	---	---	Active cascade to crib
4	224-MW	54.5	---	---	Active cascade to crib

Waste Status Summary of 204-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1953	224-MW	54.5	---	---	Active cascade to crib
2	224-MW	54.5	0	54.5	
3	224-MW	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1954	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1955	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1956	224	54.5	0	54.5	
2	224	54.5	0	54.5	
3	224	54.5	0	54.5	
4	224	54.5	0	54.5	
1-1957	224	56	1.5	54.5	Latest electrode reading
2	224	56	1.5	54.5	
3	224	56	1.5	54.5	
4	224	56	1.5	54.5	
1-1958	224	56	1.5	54.5	
2	224	56	1.5	54.5	
3	224	56	1.5	54.5	
4	224	55	0.5	54.5	Latest electrode readings
1-1959	224	56	1.5	54.5	Latest electrode reading
2	224	56	1.5	54.5	New electrode
3	224	56	1.5	54.5	
4	224	54	0	54	Latest electrode reading
1-1960	224	54	0	54	New electrode installed
2	224	54	0	54	
3	224	54	0	54	
4	224	54	0	54	
1-1961	224	54	0	54	
2	224	54	0	54	
3	224	54	0	54	
4	224	54	0	54	

Waste Status Summary of 204-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1962	224	---	---	54.5	
2	224	56	1.5	54.5	
3	224	56	---	54	
4	224	56	2	54	
1-1963	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	Latest electrode reading
1-1964	224	---	---	54	
2	224	55	1	54	New electrode
3	224	55		54	
4	224	55		54	
1-1965	---	---	---	54	
2	224	58	4	54	
3	224	56	2	54	
4	224	56	2	54	
1-1966	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1967	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1968	224	56	2	54	
2	224	56.	2	54	
3	224	56	2	54	
4	224	56	2	54	
1-1969	224	56	2	54	
2	224	56	2	54	
3	224	56	2	54	
4		56	2	54	
1-1970	224	56	8	48	
2	224	56	8	48	
3	224	56	8	48	
4	224	56	8	48	

Waste Status Summary of 204-B Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1971	224	56	8	48	
2	224	56	8	48	
3	224	56	8	48	
4	224	56	8	48	
1-1972	224	56	10	46	
2	224	56	10	46	
3	224	56	10	46	
4	224	56	10	46	
1-1973	224	56	10	46	
2	224	56	10	46	
3	224	56	10	46	
4	224	56	10	46	
1-1974	224	49	3	46	6 to 109-B
2	224	49	3	46	
3	224	49	3	46	
4	224	49	3	46	
1-1975	224	49	3	46	
2	224	49	3	46	
3	224	49	3	46	
4	224	49	3	46	
1-1976	224	49	3	46	Removed from Service
2	224	49	3	46	
3	---	49	3	46	Restricted
4	---	49	3	46	"
1-1977	---	49	3	46	Restricted
2	---	49	3	46	"
3	---	49	3	46	Inactive Current
4	---	49	3	46	" "

Waste Status Summary of 204-B Tank-Capacity 530,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	49	3	46	Inactive
2-	NCPLX	49	3	46	
3-	NCPLX	49	3	46	
4-	NCPLX	49	3	46	
1-1979	NCPLX	49	3	46	
2-	NCPLX	49	3	46	
3-	NCPLX	49	3	46	
4-	NCPLX	49	3	46	New Photo 10/16/79
1-1980	NCPLX	49	3	46	
2-	NCPLX	49	3	46	
3-	NCPLX	50	3	47	
4-	NCPLX	50	3	47	

Waste Status Summary of 201-T Tank-Capacity 55,000 Gallons.

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1952	---	---	---	---	
2	224	54.5	---	---	These 4 tanks out of service 5/29/52.
3	224	54.5	---	---	
4	224	54.5	---	---	
1-1953	---	54.5	---	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1954	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1955	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1956	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1957	---	54.5	0	54.5	Estimated reading.
2	---	54.5	0	54.5	New electrode reading.
3	---	54		54.5	
4	---	54		54.5	
1-1958	224	54	.5	54.5	
2	224	54	.5	54.5	
3	224	54	.5	54.5	
4	224	54	.5	54.5	
1-1959	224	54	.5	54.5	
2	224	54	.5	54.5	
3	224	54	.5	54.5	
4	224	54	.5	54.5	

201-T-2 WHC-MR-0132

Waste Status Summary of 201-T Tank-Capacity 55,0000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1960	224	54	.5	54.5	
2	224	54	.5	54.5	
3	224	54	.5	54.5	
4	224	54	.5	54.5	
1-1961	---	---	---	---	6 Month Report
2	224	54	.5	54.5	
3	---	---	---	---	
4	224	54	.5	54.5	6 Month Report
1-1962	---	---	---	---	
2	224	53	---	53	6 Month Report
3	---	---	---	---	
4	224	52	2	50	Latest electrode readings.
1-1963	---	---	---	---	6 Month Report
2	224	54	4	50	New electrode reading.
3	---	---	---	---	6 Month Report
4	224	54	4	50	
1-1964	---	---	---	---	
2	224	54	4	50	6 Month Report
3	---	---	---	---	
4	224	54	4	50	6 Month Report
1-1965	---	---	---	---	6 Month Report
2	224	53	20	33	
3	224	53	20	33	
4	224	53	20	33	
1-1966	224	53	20	33	
2	224	53	20	33	
3	224	53	20	33	
4	224	53	20	33	
1-1967	224	53	20	33	
2	224	53	20	33	
3	224	53	20	33	
4	224	53	20	33	
1-1968	224	48	15	33	
2	224	48	15	33	
3	224	48	15	33	
4	224	49	16	33	

Waste Status Summary of 201-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1969	224	53	20	33	
2	224	54	21	33	
3	224	54	21	33	
4	224	54	21	33	
1-1970	224	54	21	33	
2	224	54	21	33	
3	224	54	21	33	
4	224	54	23	31	
1-1971	224	54	23	31	
2	224	54	23	31	
3	224	54	23	31	
4	224	54	23	31	
1-1972	224	54	23	31	
2	224	54	23	31	
3	224	54	23	31	
4	224	54	23	31	
1-1973	224	54	23	31	
2	224	54	23	31	
3	224	54	23	31	
4	224	54	23	31	
1-1974	224	54	23	31	
2	224	54	23	31	
3	224	54	23	31	
4	224	54	23	31	
1-1975	224	54	23	31	
2	224	54	23	31	
3	224	54	23	31	
4	224	54	23	31	
1-1976	224	34	3	31	Removed from service 21 to 101-T
2	224	33	2	31	" " " 1 to 101-T.
3	Evap.	31	0	31	Inactive salt well pumping.
4	---	31	0	31	
1-1977	---	31	0	31	Salt Well, Pump
2	---	31	0	31	Salt Well, Pump
3	---	31	0	31	Inactive Current
4	---	31	0	31	" " " Salt Well installed

201-T-4 WHC-MR-0132

Waste Status Summary of 201-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	28	0	28	Photo taken 2-27-78 Prim. Stabilized
2-	-	27	0	27	New Solids Level Adj. 5-31-78
4-	-	27	0	27	
1-1979	-	27	0	27	
2-	-	27	0	27	
3-	-	27	0	27	
4-	-	27	0	27	
1-1980	-	27	0	27	New Photo 3-10-80
2-	-	27	0	27	
3-	-	28	0	28	
4-	-	28	0	28	

202-T-1 WHC-MR-0132

Waste Status Summary of 202-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1952	---	---	---	---	
2	224	54.5	---	---	
3	224	54.5	---	---	
4	224	54.5	---	---	
1-1953	---	54.5	---	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1954	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1955	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1956	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1957	---	54.5	0	54.5	Estimated reading.
2	---	54.5	0	54.5	New electrode reading.
3	224	55	.5	54.5	Latest electrode reading.
4	224	55	.5	54.5	
1-1958	224	55	.5	54.5	
2	224	55	.5	54.5	
3	224	55	.5	54.5	
4	224	55	.5	54.5	
1-1959	224	56	1.5	54.5	
2	224	55	.5	54.5	
3	224	55	.5	54.5	
4	224	55	.5	54.5	

202-T-2

WHC-MR-0132

Waste Status Summary of 202-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1960	224	55	.5	54.5	
2	224	55	.5	54.5	
3	224	55	.5	54.5	
4	224	55	.5	54.5	
1-1961	---	---	---	---	
2	224	55	.5	54.5	6 Month Report
3	---	---	---	---	" " "
4	224	55	.5	54.5	
1-1962	---	---	---	---	" " "
2	224	54	---	54	
3	---	---	---	---	
4	224	53	3	50	Latest electrode readings.
1-1963	---	---	---	---	
2	224	53	3	50	New electrode reading.
3	---	---	---	---	6 Month Report
4	224	53	3	50	
1-1964	---	---	---	---	" " " "
2	224	53	3	50	
3	---	---	---	---	" " " "
4	224	53	3	50	
					" " " "
1-1965	---	---	---	---	
2	224	52	22	30	
3	224	52	22	30	
4	224	52	22	30	
1-1966	224	52	22	30	
2	224	52	22	30	
3	224	52	22	30	
4	224	52	22	30	
1-1967	224	52	22	30	
2	224	52	22	30	
3	224	52	22	30	
4	224	52	22	30	
1-1968	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	

Waste Status Summary of 202-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1969	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1970	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1971	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1972	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1973	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1974	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1975	224	51	21	30	
2	224	51	21	30	
3	224	51	21	30	
4	224	51	21	30	
1-1976	---	25	0	25	Removed from service 27 to 101-T
2	---	25	0	25	" " " 1 to 101-T.
3	---	25	0	25	Inactive salt well pumping.
4	---	25	0	25	
1-1977	---	25	0	25	Salt Well, Pump
2.	---	25	0	25	Inactive, current
3	---	25	0	25	" " "
4	---	25	0	25	" " " Salt Well Installed

202-T-4 WHC-MR-0132

Waste Status Summary of 202-T Tank-Capacity 50,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	20	0	20	Prim. Stabl., Photo taken 2-27-78
2-	-	20	0	20	Solids Level taken 1-31-
3-	-	20	0	20	
4-	-	20	0	20	
1-1979	-	20	0	20	
2-	-	20	0	20	
3-	-	20	0	20	
4-	-	20	0	20	New Photo 10-12-79
1-1980	-	20	0	20	
2-	-	20	0	20	
3-	-	21	0	21	
4-	-	21	0	21	

Waste Status Summary of 203-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1952	---	---	---	---	
2	224	54.5	---	---	
3	224	54.5	---	---	
4	224	54.5	---	---	
1-1953	---	54.5	---	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1954	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1955	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1956	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1957	---	54.5	0	54.5	Estimated reading.
2	---	54.5	0	54.5	New electrode reading.
3	224	55	.5	54.5	Latest electrode reading.
4	224	55	.5	54.5	
1-1958	224	55	.5	54.5	
2	224	55	.5	54.5	
3	224	55	0	55	
4	224	55	.5	54.5	
1-1959	224	55	.5	54.5	
2	224	55	.5	54.5	
3	224	55	.5	54.5	
4	224	55	.5	54.5	

203-T-2 WHC-MR-0132

Waste Status Summary of 203-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1960	224	55	.5	54.5	
2	224	55	.5	54.5	
3	224	55	.5	54.5	
4	224	55	.5	54.5	
1-1961	---	---	---	---	
2	224	55	.5	54.5	6 Month Report
3	---	---	---	---	
4	224	55	.5	54.5	" " " "
1-1962	---	---	---	---	
2	224	54	---	54	" " " "
3	---	---	---	---	" " " "
4	224	53	3	50	Latest electrode reading.
1-1963	---	---	---	---	
2	224	53	3	50	New electrode reading.
3	---	---	---	---	
4	224	53	3	50	6 Month Report
1-1964	---	---	---	---	
2	224	53	3	50	" " " "
3	---	---	---	---	
4	224	53	3	50	" " " "
1-1965	---	---	---	---	" " " "
2	224	52	17	35	
3	224	52	17	35	
4	224	52	17	35	
1-1966	224	52	17	35	
2	224	52	17	35	
3	224	52	17	35	
4	224	52	17	35	
1-1967	224	52	17	35	
2	224	52	17	35	
3	224	52	17	35	
4	224	51	16	35	
1-1968	224	47	12	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	

203-T-3 WHC-MR-0132

Waste Status Summary of 203-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1969	224	51	16	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	
1-1970	224	51	16	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	
1-1971	224	51	16	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	
1-1972	224	51	16	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	
1-1973	224	51	16	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	
1-1974	224	51	16	35	
2	224	51	16	35	
3	224	51	16	35	
4	224	51	16	35	
1-1975	224	51	17	35	
2	224	51	17	35	
3	224	51	17	35	
4	224	51	17	35	
1-1976	224	50	15	35	Removed from service 1 to 101-T.
2	224	42	7	35	" " " 1 to 101-T.
3	Evap.	41	6	35	Inactive salt well pumping.
4	Evap.	40	5	35	
1-1977	Evap.	39	4	35	Salt Well, Pumping
2	Evap.	38	3	35	" " " "
3	Evap.	36	3	35	" " " "
4	Evap.	36	1	35	Salt Well Installed

203-T-4 WHC-MR-0132

Waste Status Summary of 203-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	37	0	37	Salt Well Installed New Solids Level 1-31-78
2-	-	36	0	36	
3-	-	36	0	36	
4-	-	36	0	36	
1-1979	-	36	0	36	Inactive Primary Stab.
2-	-	36	0	36	
3-	-	36	0	36	
4-	-	36	0	36	
1-1980	-	36	0	36	New Photo 3-18-80
2-	-	36	0	36	
3-	-	37	0	37	
4-	-	37	0	37	

Waste Status Summary of 204-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1952	---	---	---	---	
2	224	54.5	---	---	
3	224	54.5	---	---	
4	224	54.5	---	---	
1-1953	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1954	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1955	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1956	---	54.5	0	54.5	
2	---	54.5	0	54.5	
3	---	54.5	0	54.5	
4	---	54.5	0	54.5	
1-1957	---	54.5	0	54.5	Estimated reading.
2	---	54.5	0	54.5	New electrode reading.
3	224	56	1.5	54.5	Latest electrode reading.
4	224	56	1.5	54.5	
1-1958	224	56	1.5	54.5	
2	224	56	1.5	54.5	
3	224	56	1.5	54.5	
4	224	56	1.5	54.5	
1-1959	224	56	1.5	545	
2	224	55	.5	54.5	
3	224	55	.5	54.5	
4	224	55	.5	54.5	

204-T-2 WHC-MR-0132

Waste Status Summary of 204-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1960	224	54	.5	54.5	
2	224	54	.5	54.5	
3	224	54	.5	54.5	
4	224	54	.5	54.5	
1-1961	---	---	---	---	
2	224	52	2.5	54.5	] 6 Month Report
3	---	---	---	---	
4	224	52	2.5	54.5	] 6 Month Report
1-1962	---	---	---	---	
2	224	54	---	54	] 6 Month Report
3	---	----	---	---	
4	224	52	2	50	] 6 Month Report Latest electrode reading.
1-1963	---	---	---	---	
2	224	52	2	50	] 6 Month Report New electrode reading.
3	---	---	---	---	
4	224	52	2	50	] 6 Month Report
1-1964	---	---	---	---	
2	224	52	2	50	] 6 Month Report
3	---	---	---	---	
4	224	52	2	50	] 6 Month Report
1-1965	---	---	---	---	
2	224	52	8	44	] 6 Month Report
3	224	52	8	44	
4	224	52	8	44	
1-1966	224	52	8	44	
2	224	52	8	44	
3	224	52	8	44	
4	224	52	8	44	
1-1967	224	52	8	44	
2	224	52	8	44	
3	224	52	8	44	
4	224	52	8	44	
1-1968	224	52	8	44	
2	224	51	7	44	
3	224	51	7	44	
4	224	51	7	44	
1-1969	224	51	7	44	
2	224	51	7	44	
3	224	51	7	44	
4	224	51	7	44	

204-T-3 WHC-MR-0132

Waste Status Summary of 204-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid In Storage	Solids In Storage	Remarks
1-1970	224	51	7	44	
2	224	51	7	44	
3	224	51	7	44	
4	224	51	7	44	
1-1971	224	51	7	44	
2	224	51	7	44	
3	224	51	7	44	
4	224	51	7	44	
1-1972	224	51	7	44	
2	224	51	7	44	
3	224	51	7	44	
4	224	51	7	44	
1-1973	224	51	7	44	
2	224	50	6	44	
3	224	50	6	44	
4	224	50	6	44	
1-1974	224	50	6	44	
2	224	50	6	44	
3	224	50	6	44	
4	224	50	6	44	
1-1975	224	50	6	44	
2	224	50	6	44	
3	224	50	6	44	
4	224	50	6	44	
1-1976	224	49	5	44	Removed from service 1 to 101-T.
2	---	44	0	44	Removed from service 5 to 101-T.
3	---	44	0	44	Inactive salt well pumping.
4	---	44	0	44	
1-1977	---	44	0	44	Salt well, pump
2	---	44	0	44	
3	---	44	0	44	Inactive current
4	---	44	0	44	Inactive current

204-T-4 WHC-MR-0132

Waste Status Summary of 204-T Tank-Capacity 55,000 Gallons

Qtr.-Year	Type Waste	Total Vol.	Liquid in Storage	Solids in Storage	Remarks
1-1978	-	37	0	37	Prim. Stab. New Solids Level 1-31-78
2-	-	37	0	37	
3-	-	37	0	37	
4-	-	37	0	37	
1-1979	-	37	0	37	
2-	-	37	0	37	
3-	-	37	0	37	
4-	-	37	0	37	
1-1980	-	37	0	37	New Photo 3-18-80
2-	-	37	0	37	
3-	-	38	0	38	
4-	-	38	0	38	

SEP 0 9 2004
STA:15 (65)

ENGINEERING DATA TRANSMITTAL

2. To: (Receiving Organization) Waste Disposal Strategic Planning	3. From: (Originating Organization) Closure Projects Engineering Support	1. EDT 821175 1A. Page 1 of 1 4. Related EDT No.: N/A 7. Purchase Order No.: N/A
5. Proj./Prog./Dept./Div.: Supplemental Treatment	6. Design Authority/Resp. Engr./Design Agent: M. E. Johnson	9. Equip./Component No.: N/A 10. System/Bldg./Facility: N/A
8. Originator Remarks: A review of waste transfer documentation was conducted to determine the origin of waste transferred into double-shell tank 241-AW-103. This review was conducted to support decisions concerning disposition of the waste present in this tank.		12. Major Assembly Dwg. No.: N/A 13. Permit/Permit Application No.: N/A
11. Receiver Remarks:	11A. Design Basis Document? ☐ Yes ☒ No	14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	RPP-22404		0	Origin of Waste in Tank 241-AW-103	N/A	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
See TFC-ESHQ-Q-INSP-C-05	1. Approval 3. Post-Review 2. Review	1. Approved 3. Reviewed no comment 5. Disapproved 2. Approved w/comment 4. Reviewed w/comment

17. SIGNATURE/DISTRIBUTION

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Auth.				1	1	B. A. Higley	Bruce A. Higley	8/23/04	R2-12
1	1	Resp. Engr. M. E. Johnson	Michael E Johnson	8/24/04	H6-19						
1	1	Resp. Mgr. W. T. Thompson	[signature]	8/24/04							
		QA									
		Safety									
		Env.									
		Design Agent									

18. Michael E Johnson 8/24/04 Signature of EDT Originator Date	19. DOE APPROVAL (if required) Ctrl. No. N/A	20. [signature] 9/8/04 Design Auth./Resp. Engr./Resp. Mgr. Date

BD-7400-172.2 (08/03)

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	M. E. Johnson	Date 08-20-2004
Project Title/Work Order RPP-22404, Origin of Waste in Tank 241-AW-103		EDT No. 821175
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
K. D. Boomer	H6-19	X			
B. A. Higley	R2-12	X			
J. G. Kristofzski	H6-03	X			
M. E. Johnson	H6-19	X			
S. M. MacKay	R2-58	X			
R. Tedeschi	H6-19	X			
TCSRC	R1-10	H			

A-6000-135 (10/97)

RPP-22404, Rev. 0

ORIGIN OF WASTE IN TANK 241-AW-103

M. E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: EDT-821175 UC:
Cost Center: 501546 Charge Code:
B&R Code: Total Pages: 60

Key Words: Hanford, double-shell tank, 241-AW-103, PUREX, N-Reactor decontamination waste, double-shell slurry feed, neutralized cladding removal waste

Abstract: A review of waste transfer documentation was conducted to determine the origin of waste transferred into double-shell tank 241-AW-103. This review was conducted to support decisions concerning disposition of the waste present in this tank.

SEP 09 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65

Nancy A. Fouad 9-9-04
Release Approval Date Release Stamp

Approved For Public Release

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into double-shell tank 241-AW-103. This review was conducted to support decisions concerning disposition of the waste present in this tank. Tank 241-AW-103 presently contains 40,000 gallons of saltcake waste, 273,000 gallons of sludge, and 786,000 gallons of supernatant.

Tank 241-AW-103 entered service in 1980 and was first used to store double-shell slurry feed (DSSF) from operation of the 242-A Evaporator, N-Reactor decontamination wastes, and miscellaneous low-activity wastes from the Plutonium-Uranium Extraction (PUREX) Plant. While the majority of these wastes were removed in 1983, the DSSF waste had precipitated leaving a heel of saltcake waste in tank 241-AW-103. The saltcake waste phase contains ~72 ηCi per gram transuranic elements, as well as ~16,490 Ci of ^{137}Cs and 1,235 Ci ^{90}Sr.

Tank 241-AW-103 was then used from 1983 through 1988 to receive neutralized cladding removal waste (NCRW) from the PUREX Plant. The NCRW formed a sludge fraction that deposited atop the saltcake waste in tank 241-AW-103. The NCRW supernatant was periodically transferred from tank 241-AW-103 to other double-shell tanks for dispositioning. The NCRW sludge phase contains approximately 445 ηCi per gram transuranic elements, as well as 33,200 Ci of ^{137}Cs and 10,800 Ci of ^{90}Sr.

In 2001, tank 241-AW-103 received ~2,975,000 liters (~786,000 gallons) of DSSF that had not been concentrated to the sodium aluminate saturation boundary. The "dilute" DSSF is a supernatant stored atop of the NCRW sludge phase. The "dilute" DSSF waste supernatant phase contains ~1.6 ηCi per gram of the transuranic elements, as well as 351,000 Ci of ^{137}Cs and 366 Ci of ^{90}Sr.

TABLE OF CONTENTS

1.0 INTRODUCTION 7

2.0 WASTE TRANSFERS ASSOCIATED WITH TANK 241-AW-103 7

2.1 DESCRIPTION OF TANK 241-AW-103 7
2.2 WASTE TRANSFERS FOR TANK 241-AW-103 10
2.2.1 Double-Shell Slurry Feed Waste Receipt (October 1980 – November 1980) 10
2.2.2 Miscellaneous PUREX Waste Receipt (January 1981) 11
2.2.3 Reactor Decontamination Waste Receipt (April 1982 – September 1982) 11
2.2.4 Waste Transfer to Tank 241-AW-106 (March 1983) 12
2.2.5 PUREX Pre-Start-Up Waste (May 1983 – September 1983) 12
2.2.6 NCRW Transfers (October 1983 – October 1994) 13
2.2.7 Double-Shell Slurry Feed Transfer (March 2001) 16
2.2.8 Composition of Waste Stored in Tank 241-AW-103 16

3.0 WASTE GENERATED AT CHEMICAL PROCESSING PLANTS 19

3.1 PUREX PLANT 19
3.1.1 Coating Dissolution 20
3.1.2 Solvent Extraction 20
3.1.3 Miscellaneous Plant Waste Solutions 21
3.2 242-A EVAPORATOR 21
3.3 100-N REACTOR DECONTAMINATION WASTE 23

4.0 SUMMARY 25

5.0 REFERENCES 26

APPENDICES

Appendix A Tank 241-AW-103 Waste Transfer Records A-1

Appendix B Surveillance Analysis Computer System (SACS) Surface Level Measurements for Tank 241-AW-103 ..... B-1

FIGURES

Figure 1. Tank 241-AW-103 Cross Section 8

Figure 2. Aerial View of 241-AW Tank Farm 9

Figure 3. 242-A Evaporator 23

Figure 4. 204-S Tanker Car Unloading Facility 24

Figure 5 204-AR Railcar Unloading Facility 24

TABLES

Table 1. Supernatant Transfers from Tank 241-AW-103 to Other Double-Shell Tanks 14

Table 2. NCRW Fill Cycle for Tanks 241-AW-103 and 241-AW-105 15

Table 3. Best Basis Inventory for Tank 241-AW-103 as of April 1, 2004 18

Table 4. Volume and Density of 241-AW-103 Waste Phases 19

LIST OF TERMS

A1SltCk	242-A Evaporator saltcake
BBI	Best-Basis Inventory
CWZr2	Zirconium cladding waste
DSSF	double-shell slurry feed
FY	fiscal year
HLW	high-level waste
PUREX	plutonium-uranium extraction
NCRW	neutralized cladding removal waste
RHO	Rockwell Hanford Operations
RMIS	Record Management Information System
SACS	Surveillance Analysis Computer System
TCSRC	Tank Characterization and Safety Resource Center
TRU	transuranic
TWINS	Tank Waste Information Network System

Units

Ci	curies
ft	feet
g	grams
kgal	kilogallons
kL	kiloliters
m	meters
mL	milliliters
ηCi	nanocuries
μCi	microcuries

1.0 INTRODUCTION

The origin of the waste in tank 241-AW-103 has been reviewed to provide information for determining the disposition of this waste. Section 2.0 discusses the origin of waste transferred into and removed from tank 241-AW-103. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to tank 241-AW-103. Section 4.0 summarizes the waste types that were transferred into tank 241-AW-103.

2.0 WASTE TRANSFERS ASSOCIATED WITH TANK 241-AW-103

This section provides a brief description of double-shell tank 241-AW-103 and summarizes waste transfers into and waste removal from this tank. In order to determine the origins of the waste presently stored in tank 241-AW-103, publicly available reports for the Hanford Site and tank farm operating records were reviewed. Information reviewed included the Hanford Site contractors' monthly reports, tank farm waste status summary reports, waste transfer records, miscellaneous letters, and technical reports. The waste transfer records are available only as photocopies from the Tank Characterization and Safety Resource Center (TCSRC) located in 2750-E building.

2.1 DESCRIPTION OF TANK 241-AW-103

Tank 241-AW-103 is a double-shell tank that was constructed from 1976 to 1980. Double-shell tanks are constructed with a primary steel liner and an outer steel liner, both inside a reinforced concrete shell and covered by a concrete reinforced dome. The primary steel liner is separated from the outer steel liner by annulus, which is equipment with leak detection capability. Tank 241-AW-103 is one of the six tanks in the 241-AW Tank Farm, as shown in Figure 2. Tank 241-AW-103 has a maximum storage capacity of 4,390,000 liters (1,160,000 gallons), a diameter of 22.9 m (75.0 ft), and an operating depth of 10.7 m (35.2 ft). Figure 1 provides a plan view of tank 241-AW-103. Tank 241-AW-103 is equipment with fifteen 4-inch diameter risers, four 12-inch diameter risers, and three 24-inch diameter risers.

Figure 1. Tank 241-AW-103 Cross Section

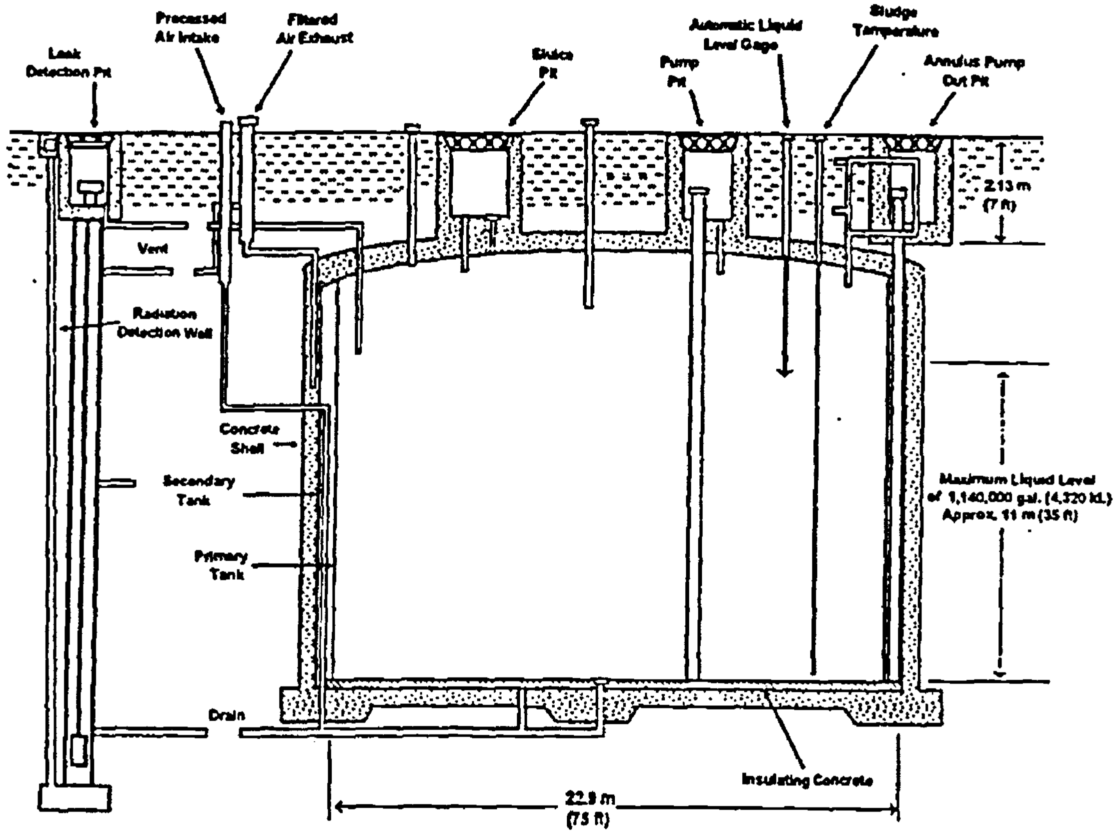
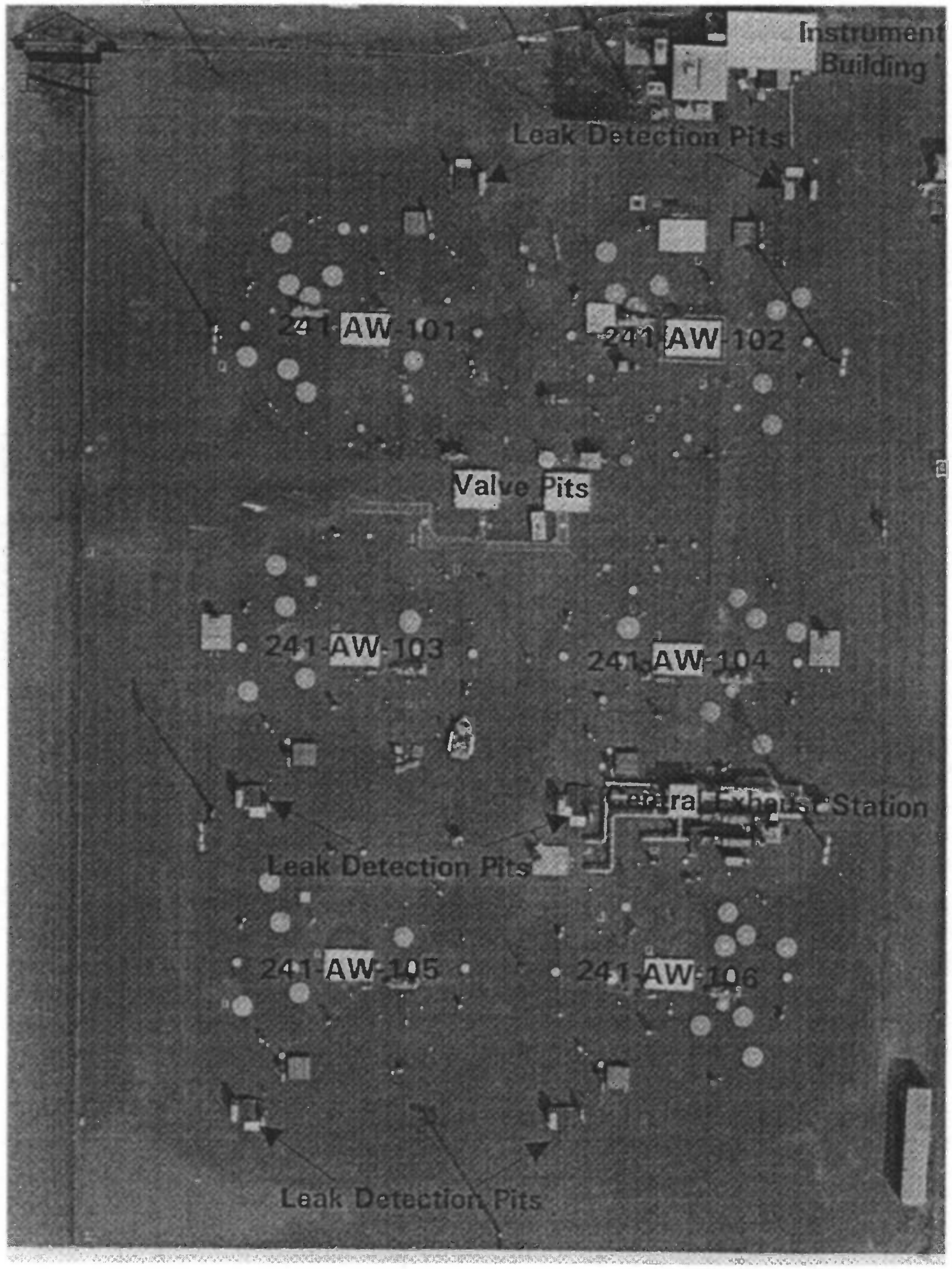


Figure 2. Aerial View of 241-AW Tank Farm



2.2 WASTE TRANSFERS FOR TANK 241-AW-103

This section describes the waste types that were transferred into and removed from tank 241-AW-103 from August 1980 to February 2004. Documentation of the waste transfers associated with tank 241-AW-103 is provided in Appendix A and Appendix B, along with the cited references. Appendix A provides a tabular listing of waste transfers associated with tank 241-AW-103. Appendix B provides a graphical representation of the waste level in tank 241-AW-103 for the period of August 1980 through February 2004. The waste level measurements for tank 241-AW-103 are from the Surveillance Analysis Computer System (SACS).

2.2.1 Double-Shell Slurry Feed Waste Receipt (October 1980 – November 1980)

Tank 241-AW-103 went into service on July 30, 1980. The tank contained approximately 3.7 to 3.8-inches (9,711 to 10,004-gallons) of water following operability testing.

Tank 241-AW-103 first received waste in October 1980, consisting of double-shell slurry feed (DSSF) waste from tanks 241-A-101[1] and 241-AX-101[2] in October 1980 (RHO 1980a and TO-230-042). Two additional transfers of DSSF waste from tank 241-AX-101 into tank 241-AW-103 occurred in November 1980 (RHO 1980b and TO-230-100). Tank 241-AW-103 contained approximately 348.8 inches (958,758 gallons) of waste following these transfers (refer to Appendix B, Figure B-1).

The DSSF waste type that was transferred into tank 241-AW-103 originated from miscellaneous, low-activity waste solutions (e.g., 100-N Reactor decontamination solution, cell drainage from Plutonium-Uranium Extraction (PUREX) Plant, B-Plant cesium ion exchange waste and dilute DSSF) that had been processed in the

[1] Tank 241-A-101 was placed in service in 1956 to receive high-level waste from the 202-A PUREX Plant. The tank continued to receive periodic transfers of PUREX high-level waste (HLW) and organic wash waste through early 1968. In the second quarter of 1968, through March 1969, the HLW supernatant and sludge in tank 241-A-101 was removed by sluicing (SD-WM-TI-302, page 159). The tank then was used to receive PUREX HLW and other miscellaneous wastes from other single-shell tanks. The supernatant was removed from the tank in fourth quarter of 1975 to allow for sluicing of the solids. Sluicing of the solids from tank 241-A-101 was conducted from the fourth quarter of 1975 through March 1976 (SD-WM-TI-302, page 159). A heel of less than 3 inches of PUREX HLW solids remained in tank 241-A-101 in April 1976 (ARH-LD-215B, page 26). Tank 241-A-101 was then used to receive DSSF waste from the 242-A Evaporator.

[2] Tank 241-AX-101 was placed in service in 1965 and initially received PUREX HLW from tank 241-A-103, along with fission product processing waste from 221-B Plant. The tank continued to receive periodic transfers of fission product processing waste from 221-B Plant and PUREX organic wash waste through the first quarter of 1969. The supernatant was removed in 1972 so the tank could receive supernatant from washing PUREX HLW sludges in tanks 241-A-103 and 241-A-104. Accumulated HLW sludge was removed from tank 241-AX-101 by sluicing from the third quarter of 1975 through February 1976. An estimated 1200 gallons (~0.5 inches) of sludge remained in tank 241-AX-101 after sluicing was completed (SD-WM-TI-302, page 175). Tank 241-AX-101 was then used to receive DSSF waste from the 242-A Evaporator.

242-A Evaporator for volume reduction as part of evaporator campaigns 80-8, 80-10, and 81-1 (RHO-SD-WM-PE-004, RHO-SD-WM-PE-006, and RHO-SD-WM-PE-007). These low-activity waste solutions were concentrated until the sodium aluminate in the solution was at or near saturation (letter 65950-83-728).

No additional waste was received into tank 241-AW-103 in December 1980. The SACS liquid level measurements for tank 241-W-103 (Appendix B, Figure B-1) show a slight downward trend (reduction of 0.2 inches) in the liquid volume for tank 241-AW-103 during December 1980, indicating possible evaporation of water.

2.2.2 Miscellaneous PUREX Waste Receipt (January 1981)

In January 1981, approximately 10,313 gallons of waste from PUREX tank G-8, 9,350 gallons of waste from PUREX tank U-4, and 6,600 gallons of waste from PUREX tank U-3 were transferred into tank 241-AW-103 (RHO 1982, DS-010681, DS-011581, DS-012381, and DS-041582). Following these transfers, tank 241-AW-103 contained approximately 355.25 inches (976,500 gallons) of waste (refer to Appendix B, Figure B-1).

PUREX tanks G-8 and R-8 collected organic solvent wash solutions (RHO-SD-RE-PCP-006, page 24). PUREX tanks U-3 and U-4 collected a purge stream from the acid fractionator, drainage from the 291-A exhaust ventilation area, miscellaneous laboratory sump wastes, and sump waste from the 206-A acid fractionator building. These waste solutions are incidental waste that resulted from the reprocessing of spent nuclear fuels at the PUREX Plant.

No additional waste was received into tank 241-AW-103 from February 1981 through March 1982.

2.2.3 Reactor Decontamination Waste Receipt (April 1982 – September 1982)

Waste solutions generated from decontamination of the 100-N Reactor were transported to the 204-AR Railcar Unloading Facility and then transferred to various double-shell tanks. Tank 241-AW-103 received 100-N Reactor decontamination waste solutions in April 1982 (18,700 gallons), May 1982 (102,775 gallons), and September 1982 (13,750 gallons) (RHO 1982).

The waste level in tank 241-AW-103 was approximately 412.5 inches (1,133,964 gallons) following these transfers (refer to Appendix B, Figure B-1). No further additions of waste to tank 241-AW-103 were made from October 1982 through March 1983.

2.2.4 Waste Transfer to Tank 241-AW-106 (March 1983)

In March 1983 (refer to Appendix B, Figure B-1), the waste contained in tank 241-AW-103 was transferred to tank 241-AW-106 for staging as feed at a later date to the 242-A Evaporator (RHO-RE-SR-14-February 1983 and RHO-RE-SR-14-March 1983). The pump failed while transferring waste from tank 241-AW-103 to tank 241-AW-106, leaving a heel of approximately 78 inches (~214,000 gallons) of 100-N Reactor decontamination and DSSF waste in tank 241-AW-103 (Tulberg 1983). Aluminate solids were noted as being present in tank 241-AW-103 after removal of the supernatant waste.

The next waste type to be stored in tank 241-AW-103 was neutralized cladding removal waste (NCRW) from the 202-A PUREX Plant (see Section 3.1 for discussion of the PUREX process). NCRW consisted of a solids fraction and a supernatant fraction containing soluble fluoride. NCRW was known to form insoluble solids when mixed with high phosphate waste such as 100-N decontamination waste. Laboratory studies were conducted with the waste heel in tank 241-AW-103 and synthetic NCRW to determine if solids would form upon mixing these two waste types (letter 65453-83-106). These studies indicated that solids would not form from mixing the waste heel in tank 241-AW-103 with NCRW. Therefore, no attempt was made to remove the waste heel from tank 241-AW-103 prior to addition of NCRW.

Estimates of the solids contained in the waste tank 241-AW-103 were made in 1987 (letter 65611-87-090). A 17-inch (~46,150-gallons) layer of saltcake solids was attributed to the DSSF waste that was stored in tank 241-AW-103 from October 1980 – March 1983. The estimated volume of saltcake solids in tank 241-AW-103 was subsequently re-evaluated in 2001 based on analysis of tank core samples (see Tank Waste Information Network System (TWINS), best-basis inventory (BBI) at http://twins.pnl.gov/data/datamenu.htm . The revised estimate of the volume of saltcake solids and interstitial liquid present in tank 241-AW-103 is approximately 40,000 gallons (~15 inches).

2.2.5 PUREX Pre-Start-Up Waste (May 1983 – September 1983)

The 202-A PUREX Plant had been idle from September 1972 through March 1983. During this period, new double-shell tanks had been constructed in 241-AW Tank Farm. Waste transfer lines from the PUREX Plant were constructed to some of these double-shell tanks. Operability testing of the waste transfer lines from the PUREX Plant to the 241-AW Tank Farm was conducted from April 14 to June 10, 1983 (RHO-SD-RE-OTR-009).

Approximately 1,925 gallons of waste were transferred from PUREX tank E-5 to tank 241-AW-103 on April 25, 1983, during operability testing of the waste transfer lines (refer to Appendix B, Figure B-1). An additional ~127,000 gallons of waste was transferred from the PUREX Plant to tank 241-AW-103 as part of pre-operational testing activities. Tank 241-AW-103 contained a total of ~342,700 gallons of waste following the completion of the pre-operational testing activities at the PUREX Plant.

After completing the operability testing activities at the PUREX Plant, approximately 264,000 gallons of supernatant was transferred from tank 241-AW-103 to tank 241-AW-105 (letter 65950-83-998PM), leaving approximately 89,000 gallons of waste in tank 241-AW-103 (see Appendix A-1).

2.2.6 NCRW Transfers (October 1983 – October 1994)

At the Hanford Site, the first step in reprocessing irradiated nuclear fuel elements involved the chemical dissolution of the cladding that surrounded the uranium fuel elements. The cladding was chemically dissolved in a chemical solution that minimized the dissolution of the irradiated uranium fuel element and the fission products trapped in the fuel element. The dissolved cladding material was separated using centrifuges from the irradiated uranium fuel elements. The cladding solution was neutralized with a caustic solution and then transferred to the Hanford Site tank system. The neutralized cladding removal waste from dissolution of Zircaloy®[3] clad fuel elements was designated as NCRW. Zircaloy® clad fuel elements were primarily processed in the 202-A PUREX Plant at the Hanford Site. NCRW was collected in PUREX tank E-5 and then transferred to underground storage tanks.

Tanks 241-AW-103 and 241-AW-105 were then used to receive NCRW from October 1983 through December 1988 (refer to Appendix B, Figures B-1 through B-4). Approximately 3.6 million gallons of NCRW was transferred to tank 241-AW-103 from May 1983 through December 1988. When tank 241-AW-103 was not receiving NCRW, the NCRW solids were allowed to settle to the bottom of the tank and a clarified supernatant layer formed. The supernatant was then periodically transferred from tank 241-AW-103 to other double-shell tanks, as listed in Table 1[4].

The dates that tanks 241-AW-103 and 241-AW-105 were used to receive NCRW are listed in Table 2 (letters 65611-86-118 and 65611-87-090). Appendix A and Appendix B provide a detailed listing of all waste transfers into tank 241-AW-103. The PUREX Plant ceased operations in December 1988, followed by a clean-out campaign. However, no waste from clean-out of PUREX was added to tank 241-AW-103.

In December 1988, the total volume of waste in tank 241-AW-103 was approximately 1,117,000 gallons. Approximately 95,700 gallons of NCRW supernatant was transferred to tank 241-AW-102 in December 1988 in preparation for processing through the 242-A Evaporator as campaign 89-1. An additional 372,100 gallons of NCRW supernatant were transferred in February and March 1989 in preparation for processing

[3] Zircaloy® is a trademark of Teledyne Wah Chang, Albany, Oregon.

[4] The dates and volumes of supernatant transferred from tank 241-AW-103 differ slightly than the values presented in Appendix A-2. These differences are due to the source data used to prepare Appendix A-2 and Table 1.

through the 242-A Evaporator as campaign 89-2 (see Appendix B, Figure B-4). No addition or removal of waste occurred from tank 241-AW-103 from December 1988 through September 1994 (refer to Appendix B, Figures B-4 and B-5).

Table 1. Supernatant Transfers from Tank 241-AW-103 to Other Double-Shell Tanks (2 Sheets)

Dates	Receipt Tank	Volume Transferred (kgal) (241-AW-103 waste level)	Reference
September 25,1983 to October 01, 1983	241-AW-105	263.8 (95.9 inches)	Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1983 (TCSRC)
October 23, 1984 to October 25, 1984	241-AW-102	461.5 (392.7 inches to 224.9 inches)	RMIS Document Accession # D195024318, RPT-100184, *Daily Operating Report Tank Farm Processing Operations*, Monthly Waste Generations Actuals - FY 1985 (TCSRC), and RHO-SD-WM-PE-019, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-1 Post Run Document*
November 01, 1984 to November 04, 1984	241-AW-102	387 (224.9 inches to 84.2 inches)	RMIS Document Accession # D195024243, RPT-110184, *Daily Operating Report Tank Farm Processing Operations*, Monthly Waste Generations Actuals - FY 1985 (TCSRC), and RHO-SD-WM-PE-019, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-1 Post Run Document*
August 1985	241-AW-102	56.7	Monthly Waste Generations Actuals - FY 1985 (TCSRC)
September 10, 1985 to October 2, 1985	241-AW-102	411.6 (401.1 inches to 251.2 inches)	RHO-SD-WM-PE-027, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-4 Post Run Document*, RMIS Document Accession # D195023891, RPT-090185, *Daily Operating Report Tank Farm Processing Operations*, and RMIS Document Accession # D195023869, RPT-100185, *Daily Operating Report Tank Farm Processing Operations*
December 6, 1985 to December 17, 1985	241-AW-102	153.2 (250.0 inches to 194.3 inches)	RHO-SD-WM-PE-026, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-1 Post Run Document*
March 20, 1986 to March 23, 1986	241-AW-102	291.6 (347.5 inches to 241.5 inches)	RHO-SD-WM-PE-029, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-3 Post Run Document*

Table 1. Supernatant Transfers from Tank 241-AW-103 to Other Double-Shell Tanks (2 Sheets)

Dates	Receipt Tank	Volume Transferred (kgal) (241-AW-103 waste level)	Reference
February 11, 1987 to February 15, 1987	241-AW-102	631.2 (394.3 inches to 164.8 inches)	WHC-SD-WM-PE-035, *242-A Evaporator / Crystallizer FY 1987 Campaign Run 87-2 Post Run Document*
April 15, 1988	241-AW-102	275 (318 inches to 218 inches)	
May 15, 1988	241-AW-102	137 (218 inches to 168.2 inches)	
December 14, 1988	241-AW-102	95.7 (406.4 inches to 371.6 inches)	WHC-SD-WM-PE-037, *242-A Evaporator FY 1989 Campaign Run 89-1 Post Run Document*
February 23, 1989 to March 14, 1989	241-AW-102	372.1 (370.8 inches to 235.5 inches)	WHC-SD-WM-PE-038, *242-A Evaporator / Crystallizer FY 1989 Campaign Run 89-2 Post Run Document*
October 1994	241-AP-107	132 (234.9 inches to 186.9 inches)	WHC-EP-0182-78, page E-7, WHC-EP-0182-79, page E-7, Internal memorandum #7CF10-42-094, "242-A Evaporator Campaign 95-1 Waste Compatibility Assessment of Tank 241-AW-103 and 241-AW-104 Waste with Tank 241-AP-107 Waste," and WHC-SD-WM-PE-055, page 2, *242-A Campaign 95-1 Post Run Document*

Table 2. NCRW Fill Cycle for Tanks 241-AW-103 and 241-AW-105

Date	NCRW Receiver Tank
May 1983 – September 1983 (Pre-PUREX Start-up)	241-AW-103
October 1983 – July 4, 1984	241-AW-103
July 4, 1984 – January 9, 1985	241-AW-105
January 9, 1985 – June 15, 1985	241-AW-103
June 15, 1985 – December 10, 1985	241-AW-105
December 10, 1985 – March 19, 1986	241-AW-103
March 19, 1986 – May 29, 1986	241-AW-105
May 29, 1986 – August 21, 1986	241-AW-103
July 1986 – July 1987	241-AW-105
August 2, 1987 – March 1988	241-AW-103
May 1988 – December 1988	241-AW-105
June 1988 – December 1988	241-AW-103

In October 1994, 132,000 gallons of NCRW supernatant was transferred from tank 241-AW-103 to tank 241-AP-107 in preparation for processing in the 242-A Evaporator as campaign 95-1 (refer to Appendix B, Figure B-6). Following this transfer, tank 241-AW-103 contained a total of approximately 514,000 gallons of waste, which was comprised of 363,000 gallons of sludge and 151,000 gallons of supernatant

(WHC-EP-0182-79, page E-7). The sludge volume includes both the NCRW solids and saltcake solids. No additional waste transfers involving tank 241-AW-103 occurred from November 1994 through February 2001 (refer to Appendix B, Figures B-6 through B-8).

It should be noted that PUREX first cycle raffinate solution was transferred from PUREX tank F-16 to tanks 241-AZ-101 and 241-AZ-102 from May 1983 through December 1988. Tanks 241-AW-103 and 241-AW-105 did not receive any PUREX first cycle raffinate waste. .

2.2.7 Double-Shell Slurry Feed Transfer (March 2001)

The U.S. Department of Energy Office of River Protection authorized the storage of DSSF in tank 241-AW-103 "... in order to gain efficiencies in tank space" (letter 0005728/00-PRD-068). On March 31, 2001, approximately 593,000 gallons of DSSF solution was transferred from tank 241-AW-106 into tank 241-AW-103 (refer to Appendix B, Figure B-8). The DSSF solution that was stored in tank 241-AW-106[5] originated from 242-A Evaporator campaign 01-01 (HNF-8588, and letters FH-0102477 and CL3120-01-029). The DSSF produced from evaporator campaign 01-01 was not concentrated to the saturation boundary for sodium aluminate and, therefore, is unlikely to precipitate salts during storage. See Section 3.2 for further discussion on operation of the 242-A Evaporator. No additional waste has been added to tank 241-AW-101 since March 2001.

2.2.8 Composition of Waste Stored in Tank 241-AW-103

The Hanford Site prepares a BBI to estimate the composition of the wastes stored in all 177 Hanford Site underground storage tanks. The BBI effort involves developing and maintaining waste tank inventories comprising 25 chemical and 46 radionuclide components in the 177 Hanford Site underground storage tanks. Waste sample analyses, process knowledge, and waste templates are used to create the BBIs. These BBIs provide waste composition data necessary as part of the River Protection Project (RPP) process flowsheet modeling work, safety analyses, risk assessments, and system design for retrieval, treatment, and disposal operations. Development and maintenance of the BBI is an on-going effort, with the current BBIs available electronically through TWINS, http://twins.pnl.gov/data/datamenu.htm .

Table 3 provides the BBIs for the major fission products and transuranic elements contained in each of the waste phases in tank 241-AW-103 as of April 1, 2004. The volume and density of each waste phase present in tank 241-AW-103 are provided in

[5] Tank 241-AW-106 was placed in service in the third quarter of 1980 and received dilute complexed waste from tank 241-A-106. In 1983, the dilute complexed waste was transferred from tank 241-AW-106 to tank 241-AW-102 for feed to the 242-A Evaporator. Tank 241-AW-106 then received supernatant from tank 241-AW-105 in 1983 that was subsequently transferred to tank 241-AW-102 for feed to the 242-A Evaporator. Beginning in April 1985, tank 241-AW-106 received DSSF from the 242-A Evaporator (RHO-SD-WM-PE-027). The DSSF received in tank 241-AW-106 is then transferred to other double-shell tanks for storage.

Table 4. The following information was used in preparing the BBI for tank 241-AW-103:

- Process knowledge for supernatant liquid waste transferred to tank 241-AW-103 (supernatant from tank 241-AW-106 from 242-A Evaporator campaign 01-01);
- Tank 241-AW-103 statistical means based on the 1997 core segment analytical results (cores 193 and 194);
- Tank 241-AW-103 statistical means based on the 1999 core segment and composite analytical results (cores 265 and 267);
- Zirconium estimates derived from fuel fabrication and PUREX processing records (HNF-SD-WM-TI-740); and
- Best Basis Inventory waste templates for A1SltCk solids, A1SltCk liquid, and CWZr2 sludge (RPP-8847).

For calculating the BBI for tank 241-AW-103, the mean concentrations for 1999 core segment data were preferred, where available. Data from the 1997 core-sampling event were second in the data hierarchy, followed by the 1999 core composite data. Templates were used for constituents below the detection limits for sample data or constituents not measured in the solids. Templates are based on sampling data from tanks that contain the same waste type as tank 241-AW-103, supplemented with Revision 5 of the Hanford Defined Waste (HDW) model data (RPP-19822). The CWZr2 sludge, A1SltCk liquid and A1SltCk solids templates were used to estimate inventories in tank 241-AW-103. The CWZr2 sludge template represents the NCRW from the PUREX Plant. The A1SltCk (Salt Cake) liquid and A1SltCk solids templates represent the residual inventory of DSSF waste that was transferred in to tank 241-AW-103 in 1980 (see Section 2.2.1). The mean concentrations from the 1999 core segment number 10 along with templates were used to prepare the BBI estimate for the saltcake liquid and solids phases reported in Table 3. A more detailed description of template data and how they are applied is found in RPP-8847.

The sum of the transuranic elements concentrations contained in the NCRW sludge phase is ~445 ηCi per gram. The sum of the transuranic elements concentrations contained in the DSSF phase (i.e., Salt Cake (Liquid) + Salt Cake (Solids)) is ~72 ηCi per gram. The supernatant waste phase contains ~1.6 ηCi per gram of the transuranic elements.

Table 3. Best Basis Inventory for Tank 241-AW-103 as of April 1, 2004

Analyte	Waste Phase	Inventory (Ci)	Basis	Concentration (μCi/g)
^{90}Sr	Salt Cake (Liquids)	3.58E+01	TS	6.86E-01
^{90}Sr	Salt Cake (Solids)	1.20E+03	S	7.06E+00
^{90}Sr	Sludge	1.08E+04	S	7.06E+00
^{90}Sr	Supernatant	3.66E+02	E	9.93E-02
^{90}Sr	Total	1.24E+04	S/E/TS	
^{99}Tc	Salt Cake (Liquids)	9.50E+00	TS	1.82E-01
^{99}Tc	Salt Cake (Solids)	4.45E+00	S	2.61E-02
^{99}Tc	Sludge	4.00E+01	S	2.61E-02
^{99}Tc	Supernatant	2.50E+02	E	6.78E-02
^{99}Tc	Total	3.04E+02	S/E/TS	
^{137}Cs	Salt Cake (Liquids)	1.28E+04	TS	2.45E+02
^{137}Cs	Salt Cake (Solids)	3.69E+03	S	2.17E+01
^{137}Cs	Sludge	3.32E+04	S	2.17E+01
^{137}Cs	Supernatant	3.51E+05	E	9.52E+01
^{137}Cs	Total	4.01E+05	S/E/TS	
^{237}Np	Salt Cake (Liquids)	1.79E-03	TS	3.42E-05
^{237}Np	Salt Cake (Solids)	1.31E-01	TE	7.23E-04
^{237}Np	Sludge	7.04E-03	TE	5.20E-06
^{237}Np	Supernatant	4.48E+00	E	1.21E-03
^{237}Np	Total	4.62E+00	E/TS/TE	
^{238}Pu	Salt Cake (Liquids)	1.79E-04	TE	3.42E-06
^{238}Pu	Salt Cake (Solids)	1.51E-01	C	7.98E-04
^{238}Pu	Sludge	3.76E+01	C	2.50E-02
^{238}Pu	Supernatant	<1.53E-01	E	4.16E-05
^{238}Pu	Total	3.79E+01	E/C/TE	
^{239}Pu	Salt Cake (Liquids)	4.36E-03	TE	8.34E-05
^{239}Pu	Salt Cake (Solids)	3.66E+00	C	1.94E-02
^{239}Pu	Sludge	3.79E+02	C	2.52E-01
^{239}Pu	Supernatant	<5.32E-01	E	1.44E-04
^{239}Pu	Total	3.84E+02	E/C/TE	
^{240}Pu	Salt Cake (Liquids)	1.01E-03	TE	1.94E-05
^{240}Pu	Salt Cake (Solids)	8.49E-01	C	4.50E-03
^{240}Pu	Sludge	1.07E+02	C	7.09E-02
^{240}Pu	Supernatant	<1.22E-01	E	3.30E-05
^{240}Pu	Total	1.08E+02	E/C/TE	
^{241}Am	Salt Cake (Liquids)	1.01E-01	TS	1.94E-03
^{241}Am	Salt Cake (Solids)	1.29E+01	C	6.84E-02
^{241}Am	Sludge	1.46E+02	C	9.71E-02
^{241}Am	Supernatant	<4.67E-01	E	1.27E-04
^{241}Am	Total	1.60E+02	E/C/TS	

Notes: S - Sample-based
M - Model-based
C - Calculated
E - Engineering assessment-based
TE - Based on an HDW model/engineering-based waste template
TS - Based on a sample-based waste template

Table 4. Volume and Density of 241-AW-103 Waste Phases

Waste Phase	Origin	Volume (kL)	Density (g/mL)
Supernatant	DSSF from 242-A Evaporator campaign 01-01. See Section 2.2.7	2,975	1.24
Saltcake Liquid	DSSF from 242-A Evaporator campaigns 80-08, 80-10, and 81-1. See Sections 2.2.2 and 2.2.4	36	1.45
Saltcake Solids	DSSF from 242-A Evaporator campaigns 80-08, 80-10, and 81-1. See Sections 2.2.2 and 2.2.4	115	1.69
Sludge	NCRW sludge. See Section 2.2.6.	1,033	1.47

3.0 WASTE GENERATED AT CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted in the processing plants are discussed further in DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997* and DOE/RL-97-1047, *Hanford Site Historic District History of the Plutonium Production Facilities 1943 – 1990.*

It has been established in Section 2.0 that neutralized DSSF from the 242-A Evaporator, 100-N Reactor decontamination waste, cladding removal waste (NCRW), and miscellaneous wastes from the 202-A PUREX Plant were transferred into tank 241-AW-103. The following sections provide a discussion of the processed that generated these waste types.

3.1 PUREX PLANT

The PUREX Plant processed irradiated nuclear fuels using a continuous solvent extraction process to separate uranium and plutonium from waste products. The 202-A PUREX Plant was constructed from April 1953 through April 1955. Following non-radioactive commissioning tests in 1955, the PUREX plant was operated from

January 1956 through September 1972 and then from October 1983 to December 1988 to reprocess irradiated nuclear fuels (PPD-493-9-DEL and WHC-MR-0437). A brief, stabilization run was conducted in 1990 and then the facility was shutdown (letter 9305270).

3.1.1 Coating Dissolution

The first step in the processing of irradiated nuclear fuels is to dissolve the coating or cladding that encases the fuel. The PUREX Plant processed both aluminum coated and zirconium clad irradiated nuclear fuels. For the aluminum coated fuel, the fuel coating was dissolved in sodium hydroxide – sodium nitrate solution. The coating removal waste (designated as CW) was inherently alkaline and did not require neutralization before transfer to underground storage tanks. Tank 241-AW-103 did not receive any coating removal waste from dissolution of aluminum clad fuel.

The zirconium clad fuel, Zircaloy® (98.5% zirconium and 1.5% tin), was dissolved in a solution of ammonium fluoride and ammonium nitrate. The ammonium fluoride / ammonium nitrate solution also attacked the uranium fuel, and a small amount of the uranium, transuranic elements, and other fission products were also dissolved in the process. Most of the uranium and transuranic elements that were dissolved during the coating dissolution were present as fluoride solids.

The cladding dissolution solution and entrained solids were removed from the dissolver by jetting to PUREX tank E-3. The uranium fuel in the dissolver was rinsed with water and the rinse water combined with the cladding waste. The cladding waste was then processed through the E Cell centrifuge, where the solution is separated from the uranium and transuranic fluoride solids and transferred to PUREX tank E-5. The uranium and transuranic fluoride solids remained in the centrifuge bowl and were metathesized to hydroxide precipitates by addition potassium hydroxide. The metathesis solution was separated from the uranium and plutonium hydroxide precipitates by centrifugation and washing. The metathesis and wash solutions were also collected in PUREX tank E-5. The cladding and metathesis wastes, plus wash solutions that were collected in PUREX Plant tank E-5 were neutralized with sodium hydroxide, and the slurry was transferred to the tank farms to allow solids in the waste to precipitate as sludge. The zirconium cladding waste was designated as NCRW (PFD-T-200-00002).

3.1.2 Solvent Extraction

After dissolving the coating / cladding on the irradiated nuclear fuel, the uranium fuel elements were then dissolved. The dissolved fuel elements are then processed through a solvent extraction system that used tri-butyl phosphate solvent in a normal paraffin hydrocarbon diluent. The fission products and impurities were separated in a nitric acid solution from the uranium and plutonium in the PUREX solvent extraction process. The nitric acid solution containing the fission products and impurities was evaporated to volatilize nitric acid for recovery and re-use in the PUREX Plant (RHO-MA-116, page 4-162).

The concentrated, acidic fission product solution was neutralized by the addition of sodium hydroxide solution in PUREX tank F-16. The neutralized waste was transferred from PUREX tank F-16 to underground storage tanks in the 200 East Area tank farms. The waste formed supernatant and sludge layers within the tanks. Most of the supernatant, known as PUREX supernatant neutralized (PSN) was eventually processed in the 221-B Plant to remove cesium. Some of the PUREX waste sludges were sluiced from single-shell tanks, acidified (waste known as PUREX Acidified Sludge [PAS]), and transferred to 221-B Plant to remove strontium.

The plutonium solutions generated at the PUREX Plant were transferred to the 234-5Z building (Z-Plant) for further processing. Uranium solutions were transferred to the 224-U building (UO_3 Plant) for conversion to an oxide and transfer to offsite facilities for re-use in the fabrication of nuclear fuel.

3.1.3 Miscellaneous Plant Waste Solutions

During the solvent extraction process conducted at the PUREX Plant, the organic solvents were washed to remove organic degradation products that would interfere with the process. The waste from washing the organic solvents, known as organic wash waste (OWW), was collected in PUREX Plant tanks G-8 and R-8 before transfer to the underground storage tanks.

Miscellaneous low, radioactivity wastes from the 291-A exhaust ventilation were also collected in PUREX Plant tank U-3 (RHO-MA-116, page 4-167). Tanks U-3 and U-4 also collected miscellaneous laboratory sump wastes and sump waste from the 206-A acid fractionator building (RHO-MA-116, page 4-167). Miscellaneous low, radioactivity wastes from the cell sumps were collected in PUREX Plant tank F-18. Sodium nitrite and sodium hydroxide were the miscellaneous low, radioactivity waste streams collected in tanks U-3, U-4, and F-18 to meet corrosion inhibitor requirements and then transferred to the underground storage tanks.

3.2 242-A EVAPORATOR

The 242-A Evaporator was constructed in the 200 East Area of the Hanford Site from 1974 through 1977. The 242-A Evaporator is the fourth tank waste evaporation unit constructed at the Hanford Site and is similar in design to the 242-S Evaporator. The 242-A Evaporator began operation in 1977 and processed intermittent batches of wastes through 1989. The evaporator was shutdown from late 1989 through early 1994 for upgrades.

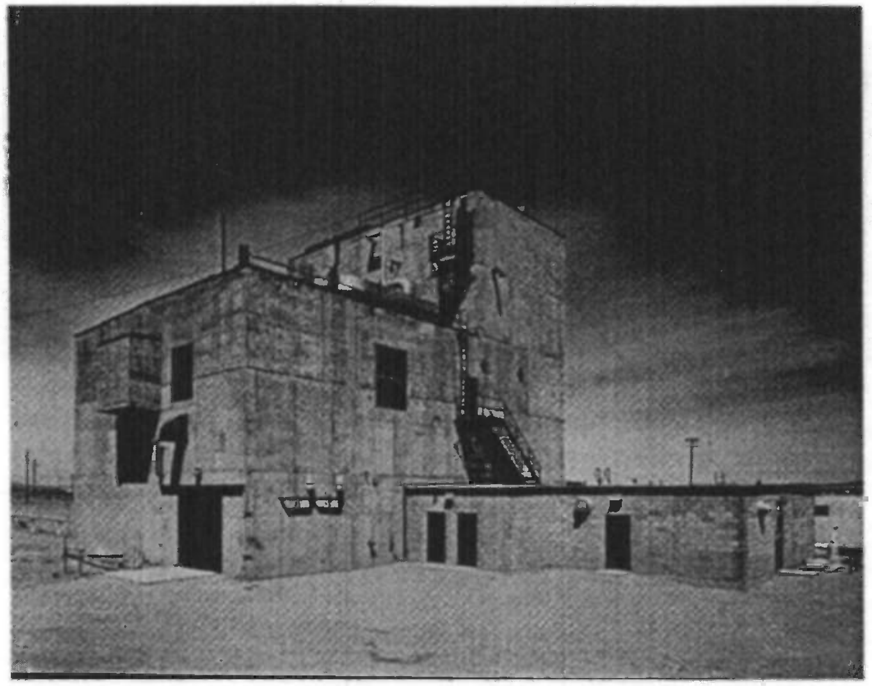
The 242-A Evaporator process employs a conventional forced-circulation, vacuum evaporation system to concentrate radioactive waste solutions. The main process components of the evaporator-crystallizer system are the re-boiler, vapor-liquid separator, recirculation pump, condensers, vacuum system, condensate collection tank, and ion exchange column (no longer in service).

Waste from tank 241-AW-102[6] is pumped into the evaporator recirculation line on the upstream side of the re-boiler at a rate to maintain a constant specific gravity in the concentrated waste. As the feed enters the recirculation line, it blends with the main process slurry stream which flows to the re-boiler. In the re-boiler, the mixture is heated slightly to a temperature normally between 130 °F and 170 °F by steam that is flowing through the re-boiler shell. The steam and waste do not come into direct contact. The heated slurry is discharged from the re-boiler to the vapor-liquid separator. A fraction of the water in the waste flashes to steam in the vapor-liquid separator and is drawn through the wire mesh de-entrainer pads into the vapor line leading to the condensers. The steam derived from the waste is condensed to water and discharged to the 200 East Area Effluent Treatment Facility. As evaporation takes place in the vapor-liquid separator vessel, the waste is concentrated. Waste flows from the vapor-liquid separator vessel to the recirculation pump suction via a drop-out leg. The recirculation pump discharges the slurry back to the re-boiler.

The process continues until the waste reaches the desired concentration point. At which point, a small fraction of the concentrated waste is withdrawn from the upper recirculation line and is pumped by the slurry pump to an underground storage tank. Prior operation of the 242-A Evaporator (1977 – 1985) was conducted to achieve super-saturation of the waste in the vapor-liquid separator vessel, which creates new salt crystal nuclei and promotes growth of existing crystals in the slurry liquor. Typically, waste was concentrated to the saturation boundary for sodium aluminate and the resulting slurry discharged from the evaporator was designated as DSSF. Waste concentrated beyond the saturation boundary for sodium aluminate is designated as double-shell slurry (DSS) with only one batch of this waste type having been made to date, which is presently stored in tank 241-AN-103. Production of DSSF and DSS were conducted to minimize the volume of wastes stored in the double-shell tanks. However, this practice was not continued when the evaporator re-started operations in 1994 because of concerns with retention of gases in the DSSF and DSS wastes.

[6] Tank 241-A-102 was used as the evaporator feed tank from 1977 through 1980.

Figure 3. 242-A Evaporator



3.3 100-N REACTOR DECONTAMINATION WASTE

This section provides only a general description of the 100-N Reactor. For further details in the 100-N Reactor, see DOE/RL-97-1047.

The 100-N Reactor is one of the nine graphite core reactor that were constructed at the Hanford Site from 1943 through 1963. The 100-N Reactor was completed in 1963 and operated until 1986. Purified water was re-circulated through the reactor core in a closed-loop cooling system. The 100-N Reactor also generated steam which was transferred to a commercial facility for the production of electricity.

Periodic maintenance was conducted on the radioactively contaminated components of the reactor. The radioactively contaminated components of the reactor were first decontaminated prior to maintenance activities. The 100-N Reactor decontamination wastes have been described as a 4 percent tri-sodium phosphate (Na_3PO_4) and 2 percent sodium sulfate (Na_2SO_4) solution (letter 65413-79-174). However, other decontamination chemicals are likely to have been used. Analyses of the 100-N Reactor decontamination solutions were not located.

The spent decontamination solutions were transported from the 100-N Reactor area via railcar to the 200 Area tank farms for storage in the underground tanks. Prior to 1980, the 100-N Reactor decontamination wastes were unloaded to tanks at the 204-S facility (see Figure 4) located in the 200 West Area and then transferred to single-shell tanks.

Beginning in 1980, the 100-N Reactor decontamination wastes were received in the 204-AR Railcar Unloading facility (see Figure 5) located in the 200-E Area of the Hanford Site and then transferred to various double-shell tanks.

Figure 4. 204-S Tanker Car Unloading Facility

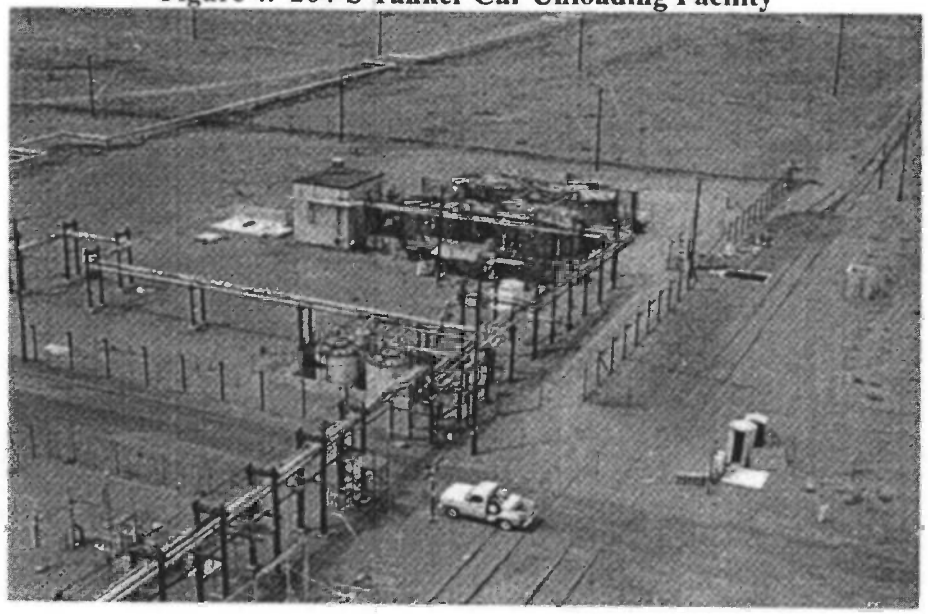
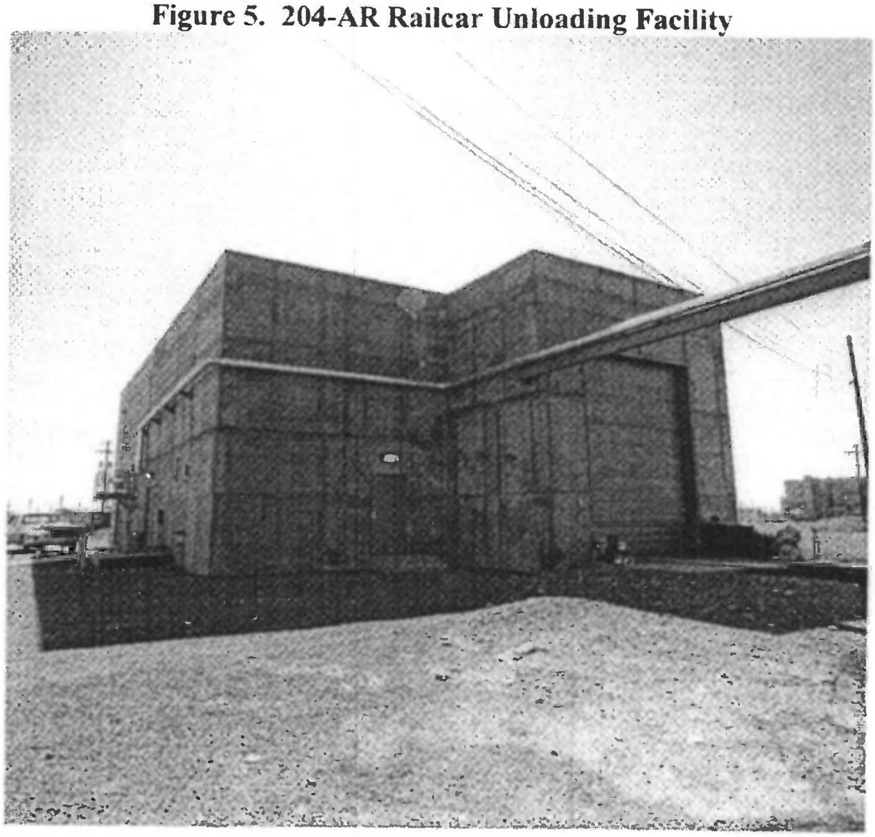


Figure 5. 204-AR Railcar Unloading Facility



4.0 SUMMARY

Tank 241-AW-103 received DSSF waste in 1980, reactor decontamination wastes in 1982, and miscellaneous low activity wastes from the PUREX Plant in 1981 - 1983. While the majority of these wastes were removed in 1983, the DSSF waste had precipitated leaving a heel of approximately 151,000 liters (~30,400 gallons or 11.4 inches of waste) of saltcake waste in tank 241-AW-103. The saltcake waste phase contains ~72 ηCi/gram transuranic elements, as well ~16,490 Ci of ^{137}Cs and 1,235 Ci ^{90}Sr.

Tank 241-AW-103 was then used from 1983 through 1988 to receive neutralized cladding removal waste (NCRW) from the PUREX Plant. The NCRW formed a sludge fraction that deposited atop the saltcake waste in tank 241-AW-103. The NCRW supernatant was periodically transferred from tank 241-AW-103 to other double-shell tanks for dispositioning. Approximately 1,033,000 liters (~272,900 gallons) of NCRW sludge are present in tank 241-AW-103. The NCRW sludge phase contains approximately 445 ηCi per gram transuranic elements, as well as 33,200 Ci of ^{137}Cs and 10,800 Ci of ^{90}Sr.

In 2001, tank 241-AW-103 received ~2,975,000 liters (~786,000 gallons) of DSSF that had not been concentrated to the sodium aluminate saturation boundary. The "dilute" DSSF is stored atop of the NCRW sludge phase. The "dilute" DSSF waste phase contains ~1.6 ηCi per gram of the transuranic elements, as well as 351,000 Ci of ^{137}Cs and 366 Ci of ^{90}Sr.

5.0 REFERENCES

0005728/00-PRD-068, 2000, "Configuration Control of Waste Feed Delivery Tank Contents," (letter from H. L. Boston to M. P. DeLozier, CH2M HILL, October 23), U. S. Department of Energy Office of River Protection, Richland, Washington. (RMIS Accession #D8472069)

65413-79-174, 1979, "Chemical Research on Customer Wastes Containing Phosphates," (letter from H. J. Eding to F. M. Jungfleisch, October 29), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195015061)

65453-83-106, 1983, "Mixing of Wastes: 103AW and Synthetic Decladding Waste," (internal letter from M. T. Jansky to D. M. Tulberg, April 11), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession #D196210663)

65611-86-118, 1986, "Sludge Height in Tanks 103-AW and 105-AW," (internal letter from J. A. Unruh to D. E. McKenney, July 7), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession #D193015184)

65611-87-090, 1987, "Tanks 241-AW-103 and 241-AW-105 Sludge Heights and Sludge Generation Rates," (internal letter from A. C. Coroneos to D. E. McKenney, May 18), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession #D193015187)

65950-83-728, 1983, *242A Evaporator Throughput*, (letter from M. C. Teats to R. A. Zinsli, January 17), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196210079)

65950-83-998PM, 1983, "Process Memo Transfer from AW103 to AW105," (letter from N. L. Pontious to Distribution, no date), Rockwell Hanford Operations, Richland, Washington. (RMIS-TFIC Accession #D196216796)

7CF10-42-094, 1994, "242-A Evaporator Campaign 95-1 Waste Compatibility Assessment of Tank 241-AW-103 and 241-AW-104 Waste with Tank 241-AP-107 Waste," (internal memorandum from R. A. Dodd to W. E. Ross, October 19), Westinghouse Hanford Company, Richland, Washington. (TCSRC)

9305270, 1992, "Termination of the Plutonium-Uranium Extraction (PUREX) Plant and Guidance to Proceed with Shutdown Planning and Terminal Cleanout Activities," (letter from W. W. Bixby, U. S. Department of Energy Deputy Assistant Secretary for Facility Transition and Management to J. D. Wagoner, Manager DOE Richland Field Office, December 21), U.S. Department of Energy, Washington, D.C.

ARH-LD-215B, 1976, *Atlantic Richfield Hanford Company Monthly Report March 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

CL3120-01-029, 2001, "Updated Waste Compatibility Assessment of Tank 241-AW-106 Waste with Tank 241-AW-103 Waste," (letter from J. A. Lechelt to R. J. Brown, March 28), CH2M HILL Hanford Group, Inc., Richland, Washington.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doc/culres/mpd/toc.htm, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-97-1047, 2002, *Hanford Site Historic District History of the Plutonium Production Facilities 1943 – 1990*, Battelle Press, Columbus, Ohio.

DS-010681, 1981, *Transfer from G-8/R-8 (PUREX) G-8 to TK-103-AW*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193198)

DS-011581, 1981, *Transfer from PUREX U-4 to AW103*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193193)

DS-012381, 1981, *Transfer from PUREX U-3 to AW103*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193196)

DS-041582, 1982, *Transfer from 204AR to AW103*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196197711)

FH-0102477, 2001, "Transmittal of 45-Day Post Campaign Report for the 242-A Evaporator Campaign 2001-01," (letter from E. S. Aromi, Waste Management Project to H. E. Bilson, U. S. Department of Energy, May 7), Fluor Hanford, Richland, Washington. (RMIS Accession #D8691108)

HNF-8588, 2001, *242-A Evaporator Campaign 01-01 Post Run Report*, Rev. 0A, Fluor Hanford, Richland, Washington.

HNF-SD-WM-TI-740, 1999, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Waste*, Rev. 0C, Lockheed Martin Hanford Corporation, Richland, Washington.

PFD-T-200-00002, 1983, 1983, *Zirflex Decladding Sludge Flowsheet – Reverse Strike*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession #D197178128)

PPD-493-9-DEL, 1972, *RL Monthly Status and Production Report – September 1972*, U.S. Atomic Energy Commission, Richland Operations Office, Richland, Washington.

RHO, 1980a, *Total Waste*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D194043901),

RHO, 1980b, *Total Waste Worksheet*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D194043902)

RHO, 1982, *Generated Waste & Evaporators from 1/01/1981 thru 11/01/1982*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193700)

RHO-MA-116, 1982, *PUREX Technical Manual*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SR-14-February 1983, 1983, *Waste Status Summary February 1983*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SR-14-March 1983, 1983, *Waste Status Summary March 1983*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-RE-OTR-009, 1983, *Operability Test Results (OTR) for Project B-281 Equipment, PUREX to 241-AW Tank Farm Process Lines and Jumpers*, . Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-007897)

RHO-SD-RE-PCP-006, 1983, *Tank Farms Process Control Plan -PUREX Waste*, Rev. B-0, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-010990)

RHO-SD-WM-PE-004, 1982, *242-A Evaporator Campaign 80-8 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-006, 1982, *242-A Evaporator Campaign 80-10 Post Run Letter*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-007, 1982, *242-A Evaporator Campaign 81-1 Post Run Letter*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-019, 1985, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-1 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-026, 1986, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-1 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-027, 1985, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-4 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-029, 1986, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-3 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RPP-8847, 2004, *Best-Basis Inventory Template Compositions of Common Tank Waste Layers*, Rev. 1, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-19822, 2004, *Hanford Defined Waste Model -Revision 5*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPT-090185, 1985, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195023891)

RPT-100184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024318)

RPT-100185, 1985, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195023869)

RPT-110184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024243)

SD-WM-TI-302, 1987, *Hanford Waste Tank Sluicing History*, Westinghouse Hanford Company, Richland, Washington.

TO-230-042, 1980, *Data Sheet Waste Tank Transfer General Process Steps*, Rockwell Hanford Operations, Richland, Washington. (TCSRC)

TO-230-100, 1980, *Data Sheet Waste Tank Transfer General Process Steps*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-005946)

Tulberg, D. M., 1983, "Tank 103 AW Heel Compatibility with Decladding Slurry," (internal letter to R. D. Wojtasek, no date), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession #D196210703)

WHC-EP-0182-78, 1994, *Waste Tank Summary Report for Month Ending September 30, 1994*, Westinghouse Hanford Company, Richland, Washington.

WHC-EP-0182-79, 1994, *Waste Tank Summary Report for Month Ending October 31, 1994*, Westinghouse Hanford Company, Richland, Washington.

WHC-MR-0437, 1993, *A Brief History of the PUREX and UO_3 Facilities*, Westinghouse Hanford Company, Richland, Washington. (RMIS Accession #D197257448)

WHC-SD-WM-PE-035, 1987, *242-A Evaporator / Crystallizer FY 1987 Campaign Run 87-2 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-037, 1989, *242-A Evaporator FY 1989 Campaign Run 89-1 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-038, 1989, *242-A Evaporator / Crystallizer FY 1989 Campaign Run 89-2 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-055, 1994, *242-A Campaign 95-12 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

TANK 241-AW-103 WASTE TRANSFER RECORDS

A.1 WASTE TRANSFER RECORDS FOR AUGUST 1980 – DECEMBER 1984

Tank 241-AW-103 waste transfer records for August 1980 through December 1984 are listed in the daily operating reports for the Tank Farms as well as individual waste transfer datasheets. Appendix A-1 provides a summary of the tank 241-AW-103 waste transfers listed in Tank Farm daily operating reports and waste transfer datasheets.

A.2 WASTE TRANSFER RECORDS FOR JANUARY 1985 – FEBRUARY 2004

Tank 241-AW-103 waste transfers that occurred after January 1, 1985 are listed in the TWINS database at the following web addresses:

- January 1, 1985 to December 2000:

  http://twins.pnl.gov/data/hcdc3s.exe?table=tcd.dbo.transfers_denorm&type=table&where1=waste_site_id+%3D+%27241-AW-103%27

- January 1, 2001 through the January 2004:

  http://twins.pnl.gov/data/hcdc3s.exe?table=tcd.dbo.v_TXFR_transfers&type=table&where1=waste_site_id+%3D+%27241-AW-103%27

All waste transfers associated with tank 241-AW-103 from January 1985 through January 2004 were downloaded from the TWINS database on February 12, 2004 and listed in Appendix A-2.

Appendix A-1

Tank 241-AW-103 Waste Transfer Records

August 1980 through December 1984

Table A-1. Tank 241-AW-103 Waste Transfer Records -August 1980 through December 1984 (5 Sheets)

Year	Month	Source	Waste Received (gallons)	Waste Removed (gallons)	Comments	References
1980	August	Water	~10,000	0	Water was added to tank as part of operability testing.	
	October	241-AX-101	268,000	0	Approximately 268,000 gallons of DSSF from evaporator campaign 80-8 was collected in tank 241-AX-101 and then transferred into tank 241-AW-103. Volume dose not include water added for transferring and flush of the pipeline following the waste transfer.	RHO-SD-WM-PE-004, *242-A Evaporator Campaign 80-8 Post Run Document*
	October	241-A-101	212,611	0	DSSF from evaporator campaigns 80-10 and 81-1 was collected in tanks 241-A-101 and 241-AX-101 to allow solids to settle and then decanted to tank 241-AW-103.	RHO-SD-WM-PE-006, *242-A Evaporator Campaign 80-10 Post Run Letter*; RHO-SD-WM-PE-007, *242-A Evaporator Campaign 81-1 Post Run Letter*; TO-230-042, *Data Sheet: Waste Tank Transfer General Process Steps, Tank 241-A-101 to Tank 241-AW-103, dated 10/07/1980 to 10/30/1980.*
	October	241-AX-101	252,501	0	DSSF from evaporator campaigns 80-10 and 81-1 was collected in tanks 241-A-101 and 241-AX-101 to allow solids to settle and then decanted to tank 241-AW-103.	RHO-SD-WM-PE-006, *242-A Evaporator Campaign 80-10 Post Run Letter*; RHO-SD-WM-PE-007, *242-A Evaporator Campaign 81-1 Post Run Letter*; TO-230-100, *Data Sheet: Waste Tank Transfer General Process Steps, Tank 241-AX-101 to Tank 241-AW-103, dated 10/24/1980 to 11/03/1980.*
	November	241-AX-101	168,604	0	DSSF from evaporator campaign 81-1 was collected in tanks 241-A-101 and 241-AX-101 to allow solids to settle and then decanted to tank 241-AW-103.	RHO-SD-WM-PE-007, *242-A Evaporator Campaign 81-1 Post Run Letter*; TO-230-100, *Data Sheet: Waste Tank Transfer General Process Steps, Tank 241-AX-101 to Tank 241-AW-103, dated 10/24/1980 to 11/03/1980.*
	December	none	0	0		
1981	January	G-8	10,313	0		RMIS Document Accession # D196193700, *Generated Waste & Evaporators from 1/01/1981 thru 11/01/1982* (RHO 1982) and DS-010681 (D196193198)
		U-4	9,350	0		DS-011581 (RMIS Document Accession # D196193193)
		U-3	6,600	0		DS-012381 (RMIS Document Accession # D196193196)
	February	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	March	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	April	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)

Table A-1. Tank 241-AW-103 Waste Transfer Records -August 1980 through December 1984 (5 Sheets)

Year	Month	Source	Waste Received (gallons)	Waste Removed (gallons)	Comments	References
	May	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	June	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	July	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	August	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	September	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	October	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	November	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	December	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
1982	January	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	February	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	March	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	April	204-AR	18,700	0	Decontamination waste from the 100-N Reactor.	RMIS Document Accession # D196193700 (RHO 1982) and # D196197711 (DS-041582)
	May	204-AR	82,775	0	Decontamination waste from the 100-N Reactor.	RMIS Document Accession # D196193700 (RHO 1982)
		100-N	20,000	0	Decontamination waste from the 100-N Reactor.	RMIS Document Accession # D196193700 (RHO 1982)
	June	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	July	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	August	none	0	0		RMIS Document Accession # D196193700 (RHO 1982)
	September	204-AR	13,750	0	Decontamination waste from the 100-N Reactor.	RMIS Document Accession # D196193700 Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	October	none	0	0		RMIS Document Accession # D196193700 Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	November	none	0	0		RMIS Document Accession # D196193700 Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	December	none	0	0		Monthly Waste Generations Actuals - FY 1983 (TCSRC)
1983	January	none	0	0		Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	February	none	0	0		Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	March	none	0	0		Monthly Waste Generations Actuals - FY 1983 (TCSRC)

Table A-1. Tank 241-AW-103 Waste Transfer Records -August 1980 through December 1984 (5 Sheets)

Year	Month	Source	Waste Received (gallons)	Waste Removed (gallons)	Comments	References
	April	PUREX E-5	1,925	0	RHO-SD-RE-OTR-009, (1983) *Operability Test Results (OTR) for Project B-281 Equipment, PUREX to 241-AW Tank Farm Process Lines and Jumpers*, identifies that 1,925 gallons of water was transferred into tank 241-AW-103 from PUREX tank E-5 on April 25, 1983 as part of the testing of transfer routes.	Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	May	PUREX E-5	65,644	0	RHO-MA-116, *PUREX Technical Manual*, page 4-20, Section 4.2.4.2 identifies that tank TK-E5 received coating waste, coating waste dissolve rinse solution, and sodium hydroxide solution (for neutralization).	Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	June	PUREX E-5	8,588	0		Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	July	none	0	0		Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	August	PUREX E-5	58,025	0		Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	September	PUREX E-5	56,787	263,770	Transferred 95.9 inches (263,770 gallons) of waste from tank 241-AW-103 to tank 241-AW-105 from September 25, 1983 through October 1, 1983. Received 56,787 gallons of waste from PUREX tank E-5.	Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1983 (TCSRC)
	October	PUREX E-5	34,650	0		Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	November	PUREX E-5	44,000	0		Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	December	PUREX E-5	78,035	0		Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1984 (TCSRC)
1984	January	PUREX E-5	151,525	0		Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	February	PUREX E-5	71,225	0		Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	March	PUREX E-5	187,850	0		Monthly Waste Generations Actuals - FY 1984 (TCSRC)

Table A-1. Tank 241-AW-103 Waste Transfer Records -August 1980 through December 1984 (5 Sheets)

Year	Month	Source	Waste Received (gallons)	Waste Removed (gallons)	Comments	References
	April	PUREX E-5	160,862	0		RMIS Document Accession # D195024363, RPT-040184, *Daily Operating Report 200 East Tank Farms Day Shift*; Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	May	PUREX E-5	118,937	0		RMIS Document Accession # D195024342, RPT-050184, *Daily Operating Report 200 East Tank Farms Day Shift*; Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	June	PUREX E-5	143,820	0		RMIS Document Accession # D195024341, RPT-060184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	July	PUREX E-5	29,975	0	Tank 241-AW-103 filled to 395.5 inches of waste as of July 4, 1984. Began routing E-5 waste to tank 241-AW-105.	RMIS Document Accession # D195024321, RPT-070184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	August	none	0	0		RMIS Document Accession # D195024320, RPT-080184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	September	none	0	0		RMIS Document Accession # D195024319, RPT-090184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1984 (TCSRC)
	October	none	0	461,530	Transferred 167.8 inches (392.7 inches to 224.9 inches) (461,530 gallons) of tank 241-AW-103 supernatant to tank 241-AW-102 from October 23, 1984 to October 25, 1984.	RMIS Document Accession # D195024318, RPT-100184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1985 (TCSRC); RHO-SD-WM-PE-019, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-1 Post Run Document*
	November	none	0	386,991	Transferred 140.7 inches (224.9 inches to 84.2 inches) (386,991 gallons) of tank 241-AW-103 supernatant to tank 241-AW-102 from November 1, 1984 to November 4, 1984.	RMIS Document Accession # D195024243, RPT-110184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1985 (TCSRC); RHO-SD-WM-PE-019, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-1 Post Run Document*
	December	none	0	0		RMIS Document Accession # D195024197, RPT-120184, *Daily Operating Report Tank Farm Processing Operations*; Monthly Waste Generations Actuals - FY 1985 (TCSRC)
1985	January	PUREX E-5	135,250	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	February	PUREX E-5	180,075	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	March	PUREX E-5	180,400	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	April	PUREX E-5	186,422	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	May	PUREX E-5	100,650	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)

Table A-1. Tank 241-AW-103 Waste Transfer Records -August 1980 through December 1984 (5 Sheets)

Year	Month	Source	Waste Received (gallons)	Waste Removed (gallons)	Comments	References
	June	PUREX E-5	68,612	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	July	PUREX E-5	61,875	0		Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	August	none	0	56,650	Transferred 56,650 gallons of supernatant waste from tank 241-AW-103 to tank 241-AW-102	Monthly Waste Generations Actuals - FY 1985 (TCSRC)
	September	none	0	274,100	Transferred approximately 136,700 gallons of supernatant waste from tank 241-AW-103 to tank 241-AW-102 from September 10, 1985 to September 11, 1985. Transferred approximately 137,500 gallons of supernatant waste from tank 241-AW-103 to tank 241-AW-102 from September 16, 1985 to September 18, 1985.	Monthly Waste Generations Actuals - FY 1985 (TCSRC); RMIS Document Accession # D195023891, RPT-090185, *Daily Operating Report Tank Farm Processing Operations*; RHO-SD-WM-PE-027, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-4 Post Run Document*
	October	none	0	137,500	Transferred approximately 137,500 gallons of supernatant waste from tank 241-AW-103 to tank 241-AW-102 on October 2, 1985.	RMIS Document Accession # D195023869, RPT-100185, *Daily Operating Report Tank Farm Processing Operations*; RHO-SD-WM-PE-027, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-4 Post Run Document*
	November	none	0	0		
	December	none	0	153,200	Transferred approximately 153,200 gallons of waste from tank 241-AW-103 to tank 241-AW-102 from December 6, 1985 to December 17, 1985.	RHO-SD-WM-PE-026, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-1 Post Run Document*

A3.0 REFERENCES

DS-010681, 1981, *Transfer from G-8/R-8 (PUREX) G-8 to TK-103-AW*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193198)

DS-011581, 1981, *Transfer from PUREX U-4 to AW103*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193193)

DS-012381, 1981, *Transfer from PUREX U-3 to AW103*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193196)

DS-041582, 1982, *Transfer from 204AR to AW103*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196197711)

RHO, 1982, *Generated Waste & Evaporators from 1/01/1981 thru 11/01/1982*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193700)

RHO-MA-116, 1982, *PUREX Technical Manual*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-RE-OTR-009, 1983, *Operability Test Results (OTR) for Project B-281 Equipment, PUREX to 241-AW Tank Farm Process Lines and Jumpers*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-007897)

RHO-SD-WM-PE-004, 1982, *242-A Evaporator Campaign 80-8 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-006, 1982, *242-A Evaporator Campaign 80-10 Post Run Letter*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-007, 1982, *242-A Evaporator Campaign 81-1 Post Run Letter*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-019, 1985, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-1 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-026, 1986, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-1 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-027, 1985, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 85-4 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RPT-040184, 1984, *Daily Operating Report 200 East Tank Farms Day Shift*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024363)

RPT-050184, 1984, *Daily Operating Report 200 East Tank Farms Day Shift*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024342)

RPT-060184, 1984, *Daily Operating Report Tank Farm Processing Operation*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024341)

RPT-070184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024321)

RPT-080184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024320)

RPT-090184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024319)

RPT-090185, 1985, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195023891)

RPT-100184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024318)

RPT-100185, 1985, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195023869)

RPT-110184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024243)

RPT-120184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024197)

TO-230-042, 1980, *Data Sheet Waste Tank Transfer General Process Steps*, Rockwell Hanford Operations, Richland, Washington. (TCSRC)

TO-230-100, 1980, *Data Sheet Waste Tank Transfer General Process Steps*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-005946)

Appendix A-2

Tank 241-AW-103 Waste Transfer Records

January 1985 through January 2004

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	Gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	1/1/1985 0:00	1/31/1985 0:00	156	kgal	172	kgal	16	kgal	356	kgal
241-AW-103	Gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	1/1/1985 0:00	1/31/1985 0:00	75	kgal	184	kgal	109	kgal	340	kgal
241-AW-103	Gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	1/1/1985 0:00	1/31/1985 0:00	184	kgal	195	kgal	11	kgal	367	kgal
241-AW-103	Gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	2/1/1985 0:00	2/28/1985 0:00	172	kgal	188	kgal	16	kgal	383	kgal
241-AW-103	Gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	2/1/1985 0:00	2/28/1985 0:00	200	kgal	321	kgal	121	kgal	509	kgal
241-AW-103	Gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	2/1/1985 0:00	2/28/1985 0:00	195	kgal	200	kgal	5	kgal	388	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	3/1/1985 0:00	3/28/1985 0:00	188	kgal	205	kgal	17	kgal	669	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	3/1/1985 0:00	3/28/1985 0:00	321	kgal	464	kgal	143	kgal	652	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	3/1/1985 0:00	3/28/1985 0:00	464	kgal	484	kgal	20	kgal	689	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	4/1/1985 0:00	4/30/1985 0:00	205	kgal	222	kgal	17	kgal	878	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	4/1/1985 0:00	4/30/1985 0:00	503	kgal	656	kgal	153	kgal	861	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	4/1/1985 0:00	4/30/1985 0:00	484	kgal	503	kgal	19	kgal	708	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	5/1/1985 0:00	5/30/1985 0:00	222	kgal	238	kgal	16	kgal	894	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	5/1/1985 0:00	5/30/1985 0:00	656	kgal	731	kgal	75	kgal	969	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	5/1/1985 0:00	5/30/1985 0:00	731	kgal	741	kgal	10	kgal	979	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	6/1/1985 0:00	6/29/1985 0:00	238	kgal	255	kgal	17	kgal	1037	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	6/1/1985 0:00	6/29/1985 0:00	741	kgal	782	kgal	41	kgal	1070	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	6/1/1985 0:00	6/29/1985 0:00	782	kgal	794	kgal	12	kgal	1049	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	7/1/1985 0:00	7/31/1985 0:00	255	kgal	267	kgal	12	kgal	1103	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	7/1/1985 0:00	7/31/1985 0:00	794	kgal	836	kgal	42	kgal	1091	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	9/2/1985 0:00	9/2/1985 0:00	836	kgal	561	kgal	-275	kgal	878	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	9/25/1985 0:00	9/25/1985 0:00	561	kgal	506	kgal	-55	kgal	773	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	10/1/1985 0:00	10/1/1985 0:00	506	kgal	423	kgal	-83	kgal	690	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	12/1/1985 0:00	12/1/1985 0:00	423	kgal	266	kgal	-157	kgal	533	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	12/15/1985 0:00	12/15/1985 0:00	266	kgal	319	kgal	53	kgal	586	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	12/15/1985 0:00	12/15/1985 0:00	267	kgal	276	kgal	9	kgal	595	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	12/15/1985 0:00	12/15/1985 0:00	319	kgal	326	kgal	7	kgal	602	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	1/1/1986 0:00	1/30/1986 0:00	333	kgal	401	kgal	68	kgal	677	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	1/1/1986 0:00	1/30/1986 0:00	326	kgal	333	kgal	7	kgal	609	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	1/30/1986 0:00	1/30/1986 0:00	276	kgal	285	kgal	9	kgal	686	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	2/1/1986 0:00	2/28/1986 0:00	414	kgal	542	kgal	128	kgal	836	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDSLO	PUREX Decladding Sludge	241-AW-103	Tank	2/1/1986 0:00	2/28/1986 0:00	285	kgal	294	kgal	9	kgal	798	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	2/1/1986 0:00	2/28/1986 0:00	401	kgal	414	kgal	13	kgal	699	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	3/1/1986 0:00	3/10/1986 0:00	294	kgal	303	kgal	9	kgal	957	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	3/1/1986 0:00	3/10/1986 0:00	542	kgal	654	kgal	112	kgal	948	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	3/15/1986 0:00	3/25/1986 0:00	351	kgal	391	kgal	40	kgal	694	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	3/15/1986 0:00	3/15/1986 0:00	654	kgal	351	kgal	-303	kgal	654	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	6/1/1986 0:00	6/30/1986 0:00	303	kgal	308	kgal	5	kgal	716	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	6/1/1986 0:00	6/30/1986 0:00	408	kgal	478	kgal	70	kgal	786	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	6/1/1986 0:00	6/30/1986 0:00	391	kgal	408	kgal	17	kgal	711	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	7/1/1986 0:00	7/30/1986 0:00	308	kgal	313	kgal	5	kgal	973	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	7/1/1986 0:00	7/30/1986 0:00	510	kgal	660	kgal	150	kgal	968	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	7/1/1986 0:00	7/30/1986 0:00	478	kgal	510	kgal	32	kgal	818	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-103	Tank	8/1/1986 0:00	8/30/1986 0:00	313	kgal	318	kgal	5	kgal	1056	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	8/1/1986 0:00	8/30/1986 0:00	674	kgal	738	kgal	64	kgal	1051	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	8/1/1986 0:00	8/30/1986 0:00	660	kgal	674	kgal	14	kgal	987	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-103	Tank	9/1/1986 0:00	9/30/1986 0:00	738	kgal	742	kgal	4	kgal	1060	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	9/1/1986 0:00	9/30/1986 0:00	742	kgal	771	kgal	29	kgal	1089	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	2/1/1987 0:00	2/28/1987 0:00	318	kgal	319	kgal	1	kgal	1090	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	2/12/1987 0:00	2/12/1987 0:00	771	kgal	141	kgal	-630	kgal	460	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	8/2/1987 0:00	8/30/1987 0:00	141	kgal	215	kgal	74	kgal	534	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	8/2/1987 0:00	8/30/1987 0:00	319	kgal	343	kgal	24	kgal	558	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	8/2/1987 0:00	8/30/1987 0:00	215	kgal	229	kgal	14	kgal	572	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	9/1/1987 0:00	9/30/1987 0:00	236	kgal	279	kgal	43	kgal	638	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	9/1/1987 0:00	9/30/1987 0:00	343	kgal	359	kgal	16	kgal	995	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	9/1/1987 0:00	9/30/1987 0:00	229	kgal	236	kgal	7	kgal	579	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	1/1/1988 0:00	1/30/1988 0:00	285	kgal	303	kgal	18	kgal	662	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	1/1/1988 0:00	1/1/1988 0:00	359	kgal	363	kgal	4	kgal	666	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	1/1/1988 0:00	1/30/1988 0:00	279	kgal	285	kgal	6	kgal	644	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	2/1/1988 0:00	2/28/1988 0:00	320	kgal	393	kgal	73	kgal	780	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	2/1/1988 0:00	2/28/1988 0:00	363	kgal	387	kgal	24	kgal	690	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	2/1/1988 0:00	2/28/1988 0:00	303	kgal	370	kgal	17	kgal	707	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	3/1/1988 0:00	3/28/1988 0:00	411	kgal	468	kgal	57	kgal	874	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	3/1/1988 0:00	3/28/1988 0:00	387	kgal	406	kgal	19	kgal	817	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	3/1/1988 0:00	3/28/1988 0:00	393	kgal	411	kgal	18	kgal	798	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	4/15/1988 0:00	4/15/1988 0:00	468	kgal	193	kgal	-275	kgal	599	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	5/15/1988 0:00	5/15/1988 0:00	193	kgal	56	kgal	-137	kgal	462	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	6/1/1988 0:00	6/30/1988 0:00	56	kgal	138	kgal	82	kgal	544	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	6/1/1988 0:00	6/30/1988 0:00	406	kgal	419	kgal	13	kgal	557	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	6/1/1988 0:00	6/30/1988 0:00	138	kgal	159	kgal	21	kgal	578	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	7/1/1988 0:00	7/30/1988 0:00	178	kgal	233	kgal	55	kgal	671	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	7/1/1988 0:00	7/30/1988 0:00	419	kgal	438	kgal	19	kgal	907	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	7/1/1988 0:00	7/30/1988 0:00	159	kgal	178	kgal	19	kgal	616	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernatant, 1987	241-AW-103	Tank	8/1/1988 0:00	8/30/1988 0:00	274	kgal	418	kgal	144	kgal	890	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-103	Tank	8/1/1988 0:00	8/30/1988 0:00	438	kgal	462	kgal	24	kgal	736	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	8/1/1988 0:00	8/30/1988 0:00	233	kgal	274	kgal	41	kgal	712	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL89	PUREX Decladding Supernatant, Non TRU, Spent Metathesis Removed	241-AW-103	Tank	9/1/1988 0:00	9/30/1988 0:00	418	kgal	460	kgal	51	kgal	911	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS89	PUREX Decladding Sludge After FY89	241-AW-103	Tank	9/1/1988 0:00	9/30/1988 0:00	462	kgal	470	kgal	8	kgal	939	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	9/1/1988 0:00	9/30/1988 0:00	469	kgal	487	kgal	18	kgal	957	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL89	PUREX Decladding Supernatant, Non TRU, Spent Metathesis Removed	241-AW-103	Tank	10/1/1988 0:00	10/30/1988 0:00	502	kgal	536	kgal	34	kgal	1012	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS89	PUREX Decladding Sludge After FY89	241-AW-103	Tank	10/1/1988 0:00	10/30/1988 0:00	470	kgal	476	kgal	6	kgal	978	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	10/1/1988 0:00	10/30/1988 0:00	487	kgal	502	kgal	15	kgal	972	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL89	PUREX Decladding Supernatant, Non TRU, Spent Metathesis Removed	241-AW-103	Tank	11/1/1988 0:00	11/30/1988 0:00	553	kgal	605	kgal	52	kgal	1089	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS89	PUREX Decladding Sludge After FY89	241-AW-103	Tank	11/1/1988 0:00	11/30/1988 0:00	476	kgal	484	kgal	8	kgal	1020	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2008 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	11/1/1988 0:00	11/30/1988 0:00	536	kgal	553	kgal	17	kgal	1037	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PDL89	PUREX Decladding Supernatant, Non TRU, Spent Metathesis Removed	241-AW-103	Tank	12/1/1988 0:00	12/30/1988 0:00	605	kgal	624	kgal	19	kgal	1108	kgal
241-AW-103	gain	PD	PUREX NCRW Sludge (TRU)	PDS89	PUREX Decladding Sludge After FY89	241-AW-103	Tank	12/1/1988 0:00	12/30/1988 0:00	484	kgal	487	kgal	3	kgal	1111	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	12/1/1988 0:00	12/3/1988 0:00	624	kgal	632	kgal	8	kgal	1119	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	12/15/1988 0:00	12/15/1988 0:00	632	kgal	536	kgal	-96	kgal	1023	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	1/1/1989 0:00	1/30/1989 0:00	536	kgal	533	kgal	-3	kgal	1020	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	2/15/1989 0:00	2/15/1989 0:00	533	kgal	293	kgal	-240	kgal	770	kgal
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AW-102	Tank	3/15/1989 0:00	3/15/1989 0:00	293	kgal	159	kgal	-134	kgal	646	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	4/1/1989 0:00	4/30/1989 0:00	159	kgal	157	kgal	-2	kgal	644	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	5/1/1989 0:00	5/30/1989 0:00	157	kgal	159	kgal	2	kgal	646	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	2/2/1990 0:00	2/28/1990 0:00	159	kgal	157	kgal	-2	kgal	644	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	3/1/1990 0:00	3/31/1990 0:00	157	kgal	159	kgal	2	kgal	646	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	8/1/1990 0:00	8/31/1990 0:00	159	kgal	154	kgal	-5	kgal	641	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	10/1/1990 0:00	10/31/1990 0:00	154	kgal	151	kgal	-3	kgal	618	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (not Fuel)	241-AW-103	Tank	1/1/1991 0:00	1/30/1991 0:00	151	kgal	161	kgal	10	kgal	648	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-103	Tank	1/1/1991 0:00	1/30/1991 0:00	161	kgal	162	kgal	1	kgal	649	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	2/1/1991 0:00	2/28/1991 0:00	162	kgal	159	kgal	-3	kgal	646	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	3/1/1991 0:00	3/31/1991 0:00	159	kgal	162	kgal	3	kgal	649	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	10/1/1991 0:00	10/31/1991 0:00	162	kgal	159	kgal	-3	kgal	646	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-103	Tank	11/1/1991 0:00	11/1/1991 0:00	159	kgal	162	kgal	3	kgal	649	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	3/1/1992 0:00	3/31/1992 0:00	162	kgal	159	kgal	-3	kgal	646	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	9/1/1992 0:00	9/30/1992 0:00	159	kgal	161	kgal	2	kgal	648	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	10/1/1992 0:00	10/31/1992 0:00	161	kgal	159	kgal	-2	kgal	646	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	1/1/1993 0:00	1/31/1993 0:00	159	kgal	158	kgal	-1	kgal	645	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	INST	Change in Tank Level Due To Change In Instrumentation	241-AW-103	Tank	3/28/1993 0:00	3/28/1993 0:00	158	kgal	163	kgal	5	kgal	650	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	INST	Loss due to Change of Instruments	5/6/1993 0:00	5/6/1993 0:00	163	kgal	158	kgal	-5	kgal	645	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	INST	Change in Tank Level Due To Change In Instrumentation	241-AW-103	Tank	8/3/1993 0:00	8/3/1993 0:00	158	kgal	161	kgal	3	kgal	648	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	12/1/1993 0:00	12/31/1993 0:00	161	kgal	160	kgal	-1	kgal	647	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	3/1/1994 0:00	3/31/1994 0:00	160	kgal	159	kgal	-1	kgal	646	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	6/1/1994 0:00	6/30/1994 0:00	159	kgal	160	kgal	1	kgal	647	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	8/1/1994 0:00	8/31/1994 0:00	160	kgal	159	kgal	-1	kgal	646	kgal
241-AW-103	evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-103	Tank	10/1/1994 0:00	10/1/1994 0:00	159	kgal	283	kgal	124	kgal	646	kgal
241-AW-103	evaporation	PD	PUREX NCRW Sludge (TRU)	DN100	Evaporation	241-AW-103	Tank	10/1/1994 0:00	10/1/1994 0:00	487	kgal	363	kgal	-124	kgal	572	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
241-AW-103	transfer	DN	Dilute Non-Complexed	241-AW-103	Tank	241-AP-107	Tank	10/19/1994 0:00	10/21/1994 0:00	283	kgal	151	kgal	-132	kgal	514	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	11/1/1994 0:00	11/30/1994 0:00	151	kgal	152	kgal	1	kgal	515	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	5/1/1995 0:00	5/31/1995 0:00	152	kgal	153	kgal	1	kgal	516	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	8/1/1995 0:00	8/31/1995 0:00	153	kgal	152	kgal	-1	kgal	515	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	9/1/1995 0:00	9/30/1995 0:00	152	kgal	151	kgal	-1	kgal	514	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	11/1/1995 0:00	11/30/1995 0:00	151	kgal	152	kgal	1	kgal	515	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	12/1/1995 0:00	12/31/1995 0:00	152	kgal	151	kgal	-1	kgal	514	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	INST	Loss due to Change of Instruments	1/31/1996 0:00	1/31/1996 0:00	151	kgal	149	kgal	-2	kgal	512	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	INST	Change In Tank Level Due To Change In Instrumentation	241-AW-103	Tank	2/6/1996 0:00	2/6/1996 0:00	149	kgal	152	kgal	3	kgal	515	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	10/1/1996 0:00	10/31/1996 0:00	152	kgal	151	kgal	-1	kgal	514	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	11/1/1996 0:00	11/30/1996 0:00	151	kgal	150	kgal	-1	kgal	513	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	1/1/1997 0:00	1/31/1997 0:00	150	kgal	149	kgal	-1	kgal	512	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	6/1/1997 0:00	6/30/1997 0:00	149	kgal	150	kgal	1	kgal	513	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc	241-AW-103	Tank	7/1/1997 0:00	7/31/1997 0:00	150	kgal	151	kgal	1	kgal	514	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc)	9/1/1997 0:00	9/30/1997 0:00	151	kgal	150	kgal	-1	kgal	513	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation,	1/1/1998 0:00	1/31/1998 0:00	150	kgal	149	kgal	-1	kgal	512	kgal

Table A-2. Tank 241-AW-103 Transfers from January 1985 Through December 2000 (8 Sheets)

Tank Name	Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume	Start Volume Units	Waste Type End Volume	End Volume Units	Transfer Volume	Transfer Volume Units	Tank Volume	Tank Volume Units
							Surface Change, Instrument, etc.)										
241-AW-103	evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-103	Tank	3/1/1998 0:00	3/1/1998 0:00	149	kgal	165	kgal	16	kgal	512	kgal
241-AW-103	evaporation	PD	PUREX NCRW Sludge (TRU)	DN100	Evaporation	241-AW-103	Tank	3/1/1998 0:00	3/1/1998 0:00	363	kgal	347	kgal	-16	kgal	496	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	12/1/1998 0:00	12/31/1998 0:00	165	kgal	164	kgal	-1	kgal	511	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	1/1/1999 0:00	1/31/1999 0:00	164	kgal	163	kgal	-1	kgal	510	kgal
241-AW-103	evaporation	SC	SST Solids saltcake	SC100	Evaporation	241-AW-103	Tank	10/1/1999 0:00	10/1/1999 0:00	0	kgal	16	kgal	16	kgal	510	kgal
241-AW-103	evaporation	SC	SST Solids saltcake	SC100	Evaporation	241-AW-103	Tank	10/1/1999 0:00	10/1/1999 0:00	16	kgal	47	kgal	31	kgal	510	kgal
241-AW-103	evaporation	DN	Dilute Non-Complexed	SC100	Evaporation	241-AW-103	Tank	10/1/1999 0:00	10/1/1999 0:00	163	kgal	147	kgal	-16	kgal	494	kgal
241-AW-103	evaporation	PD	PUREX NCRW Sludge (TRU)	SC100	Evaporation	241-AW-103	Tank	10/1/1999 0:00	10/1/1999 0:00	347	kgal	316	kgal	-31	kgal	479	kgal
241-AW-103	evaporation	SL	DSS/SST solids Sludge	SL100	Evaporation	241-AW-103	Tank	10/1/1999 0:00	10/1/1999 0:00	0	kgal	316	kgal	316	kgal	510	kgal
241-AW-103	evaporation	PD	PUREX NCRW Sludge (TRU)	SL100	Evaporation	241-AW-103	Tank	10/1/1999 0:00	10/1/1999 0:00	316	kgal	0	kgal	-316	kgal	194	kgal
241-AW-103	gain	DN	Dilute Non-Complexed	INST	Change In Tank Level Due To Change In Instrumentation	241-AW-103	Tank	12/22/1999 0:00	12/22/1999 0:00	147	kgal	149	kgal	2	kgal	512	kgal
241-AW-103	evaporation	SC	SST Solids saltcake	SL100	Evaporation	241-AW-103	Tank	3/1/2000 0:00	3/1/2000 0:00	47	kgal	46	kgal	-1	kgal	511	kgal
241-AW-103	evaporation	SL	DSS/SST solids Sludge	SL100	Evaporation	241-AW-103	Tank	3/1/2000 0:00	3/1/2000 0:00	316	kgal	317	kgal	1	kgal	512	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	INST	Loss due to Change of Instruments	6/13/2000 0:00	6/13/2000 0:00	149	kgal	147	kgal	-2	kgal	510	kgal
241-AW-103	loss	DN	Dilute Non-Complexed	241-AW-103	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	10/1/2000 0:00	10/31/2000 0:00	147	kgal	146	kgal	-1	kgal	509	kgal

Table A-3. Tank 241-AW-103 Waste Transfers from January 2001 through January 2004 (2 Sheets)

Tank Name	Event Type	Waste Phase	Waste Designation	Waste Designation Description	Source	Destination	Reason	Start Date	End Date	Volume Units	Previous Waste Type Volume	New Waste Type Volume	Transfer Volume	Tank Total Volume	Comment
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	General Variance (+/-)	1/1/2001 0:00	1/31/2001 0:00	kgal	196	195	-1	508	
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	General Variance (+/-)	1/1/2001 0:00	1/31/2001 0:00	kgal	40	40	0	508	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	General Variance (+/-)	1/1/2001 0:00	1/31/2001 0:00	kgal	273	273	0	508	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Rebaseline	1/1/2001 0:00	1/1/2001 0:00	kgal	0	196	196	509	
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Rebaseline	1/1/2001 0:00	1/1/2001 0:00	kgal	0	40	40	509	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Rebaseline	1/1/2001 0:00	1/1/2001 0:00	kgal	0	273	273	509	
241-AW-103	TANK	Salt Cake Solid	SC	Salt Cake Solid	241-AW-106	241-AW-103	Tank to Tank Transfer	3/31/2001 0:00	3/31/2001 0:00	kgal	40	40	0	840	concentrated waste from campaign 01-01
241-AW-103	TANK	Supernatant	SP	Super (SP) (Concentrated Supernatant)	241-AW-106	241-AW-103	Tank to Tank Transfer	3/31/2001 0:00	3/31/2001 0:00	kgal	0	332	332	840	concentrated waste from campaign 01-01
241-AW-103	TANK	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	241-AW-106	241-AW-103	Tank to Tank Transfer	3/31/2001 0:00	3/31/2001 0:00	kgal	195	195	0	840	concentrated waste from campaign 01-01
241-AW-103	TANK	Sludge	SL	Sludge Solid	241-AW-106	241-AW-103	Tank to Tank Transfer	3/31/2001 0:00	3/31/2001 0:00	kgal	273	273	0	840	concentrated waste from campaign 01-01
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Gas (+/-)	4/1/2001 0:00	4/30/2001 0:00	kgal	40	40	0	1102	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Gas (+/-)	4/1/2001 0:00	4/30/2001 0:00	kgal	273	273	0	1102	
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Gas (+/-)	4/1/2001 0:00	4/30/2001 0:00	kgal	597	594	-3	1102	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Gas (+/-)	4/1/2001 0:00	4/30/2001 0:00	kgal	195	195	0	1102	
241-AW-103	TANK	Salt Cake Solid	SC	Salt Cake Solid	241-AW-106	241-AW-103	Tank to Tank Transfer	4/1/2001 0:00	4/3/2001 0:00	kgal	40	40	0	1105	
241-AW-103	TANK	Supernatant	SP	Super (SP) (Concentrated Supernatant)	241-AW-106	241-AW-103	Tank to Tank Transfer	4/1/2001 0:00	4/3/2001 0:00	kgal	332	597	265	1105	
241-AW-103	TANK	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	241-AW-106	241-AW-103	Tank to Tank Transfer	4/1/2001 0:00	4/3/2001 0:00	kgal	195	195	0	1105	
241-AW-103	TANK	Sludge	SL	Sludge Solid	241-AW-106	241-AW-103	Tank to Tank Transfer	4/1/2001 0:00	4/3/2001 0:00	kgal	273	273	0	1105	
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Gas (+/-)	12/1/2001 0:00	12/31/2001 0:00	kgal	40	40	0	1101	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Gas (+/-)	12/1/2001 0:00	12/31/2001 0:00	kgal	273	273	0	1101	
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Gas (+/-)	12/1/2001 0:00	12/31/2001 0:00	kgal	594	593	-1	1101	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Gas (+/-)	12/1/2001 0:00	12/31/2001 0:00	kgal	195	195	0	1101	
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Gas (+/-)	3/1/2002 0:00	3/31/2002 0:00	kgal	40	40	0	1100	

Table A-3. Tank 241-AW-103 Waste Transfers from January 2001 through January 2004 (2 Sheets)

Tank Name	Event Type	Waste Phase	Waste Designation	Waste Designation Description	Source	Destination	Reason	Start Date	End Date	Volume Units	Previous Waste Type Volume	New Waste Type Volume	Transfer Volume	Tank Total Volume	Comment
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Gas (+/-)	3/1/2002 0:00	3/31/2002 0:00	kgal	593	592	-1	1100	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Gas (+/-)	3/1/2002 0:00	3/31/2002 0:00	kgal	273	273	0	1100	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Gas (+/-)	3/1/2002 0:00	3/31/2002 0:00	kgal	195	195	0	1100	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Gas (+/-)	8/1/2002 0:00	8/31/2002 0:00	kgal	195	196	1	1101	
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Gas (+/-)	8/1/2002 0:00	8/31/2002 0:00	kgal	40	40	0	1101	
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Gas (+/-)	8/1/2002 0:00	8/31/2002 0:00	kgal	592	592	0	1101	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Gas (+/-)	8/1/2002 0:00	8/31/2002 0:00	kgal	273	273	0	1101	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Gas (+/-)	10/1/2002 0:00	10/31/2002 0:00	kgal	196	195	-1	1100	
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Gas (+/-)	10/1/2002 0:00	10/31/2002 0:00	kgal	40	40	0	1100	
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Gas (+/-)	10/1/2002 0:00	10/31/2002 0:00	kgal	592	592	0	1100	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Gas (+/-)	10/1/2002 0:00	10/31/2002 0:00	kgal	273	273	0	1100	
241-AW-103	ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-103	Analysis (+/-)	11/15/2002 0:00	11/15/2002 0:00	kgal	195	0	-195	1100	changed DN to SP, because most of the supernatant is SP per BBI lead Engineer
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Analysis (+/-)	11/15/2002 0:00	11/15/2002 0:00	kgal	40	40	0	1100	changed DN to SP, because most of the supernatant is SP per BBI lead Engineer
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Analysis (+/-)	11/15/2002 0:00	11/15/2002 0:00	kgal	592	787	195	1100	changed DN to SP, because most of the supernatant is SP per BBI lead Engineer
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Analysis (+/-)	11/15/2002 0:00	11/15/2002 0:00	kgal	273	273	0	1100	changed DN to SP, because most of the supernatant is SP per BBI lead Engineer
241-AW-103	ADJ	Salt Cake Solid	SC	Salt Cake Solid	ADJ	241-AW-103	Gas (+/-)	1/1/2004 0:00	1/31/2004 0:00	kgal	40	40	0	1099	
241-AW-103	ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-103	Gas (+/-)	1/1/2004 0:00	1/31/2004 0:00	kgal	273	273	0	1099	
241-AW-103	ADJ	Supernatant	SP	Super (SP) (Concentrated Supernatant)	ADJ	241-AW-103	Gas (+/-)	1/1/2004 0:00	1/31/2004 0:00	kgal	787	786	-1	1099	

APPENDIX B

SURVEILLANCE ANALYSIS COMPUTER SYSTEM (SACS)

SURFACE LEVEL MEASUREMENTS FOR TANK 241-AW-103

B.1 SURFACE LEVEL MEASUREMENTS

From August 4, 1980 to the present, the surface level of the waste stored in tank 241-AW-103 was either manually measured or measured with an automated instrument. The waste surface level measurements were recorded in the Surveillance Analysis Computer System (SACS). The SACS measurements of the waste surface level can be accessed through the Tank Waste Information Network System (TWINS) database at the following web addresses:

> http://twins.pnl.gov/data/getLookupFields3.exe?table=twins_catalog.dbo.lp_Retrieve_SACS_SL&whatsnew=Measurements

The surface level measurements for the waste stored in tank 241-AW-103 were downloaded from the TWINS database on February 12, 2004. The surface level measurements for the waste stored in tank 241-AW-103 are plotted in Appendix B for August 4, 1980 through February 11, 2004. The waste transfer records in Appendices A are consistent with waste surface level measurements in Appendix B.

Figure B-1.

**Tank 241-AW-103 Waste Surface Level
August 1980 - July 1983**

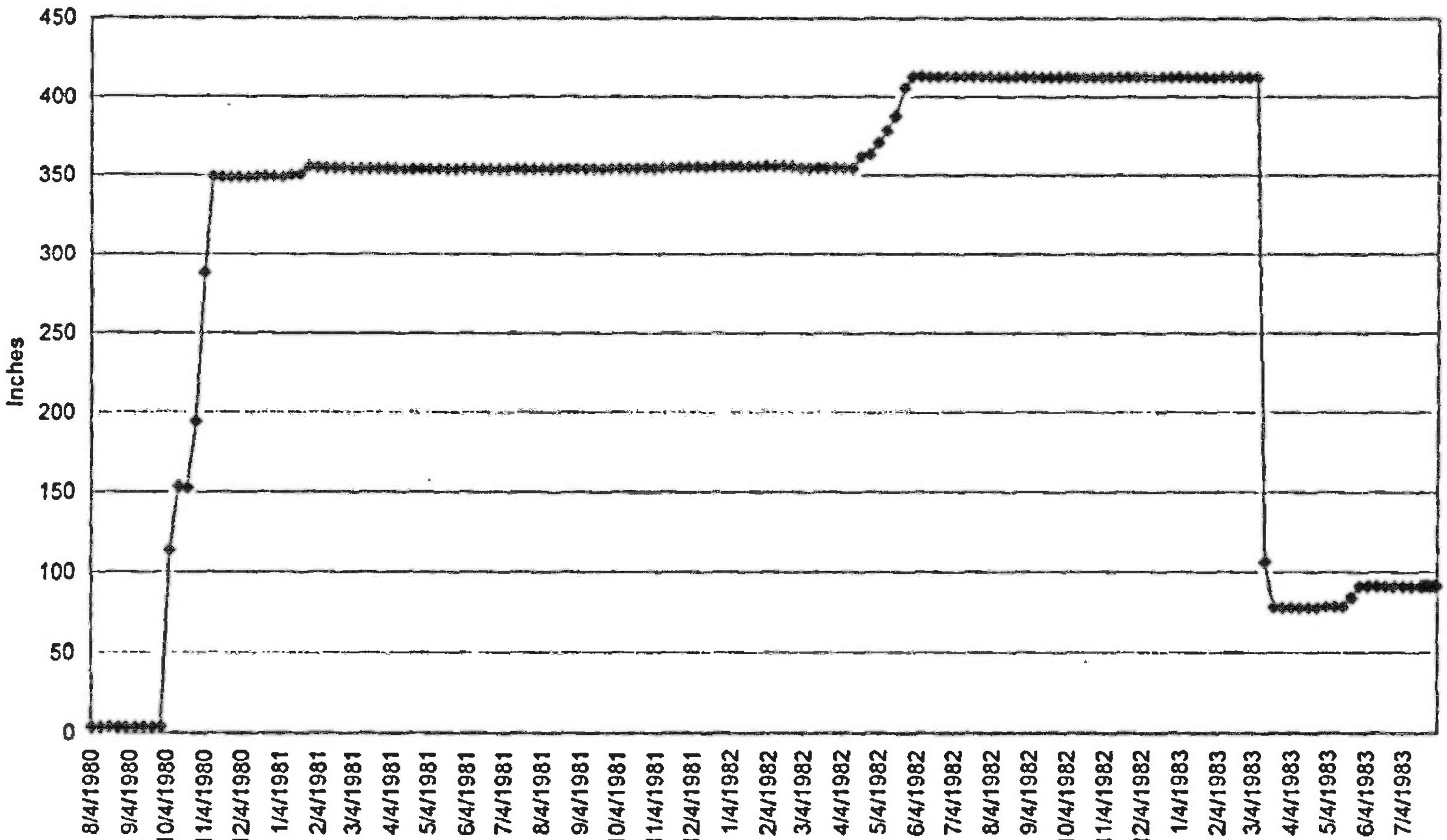


Figure B-2.

Tank 241-AW-103 Waste Surface Level
August 1983 - December 1984

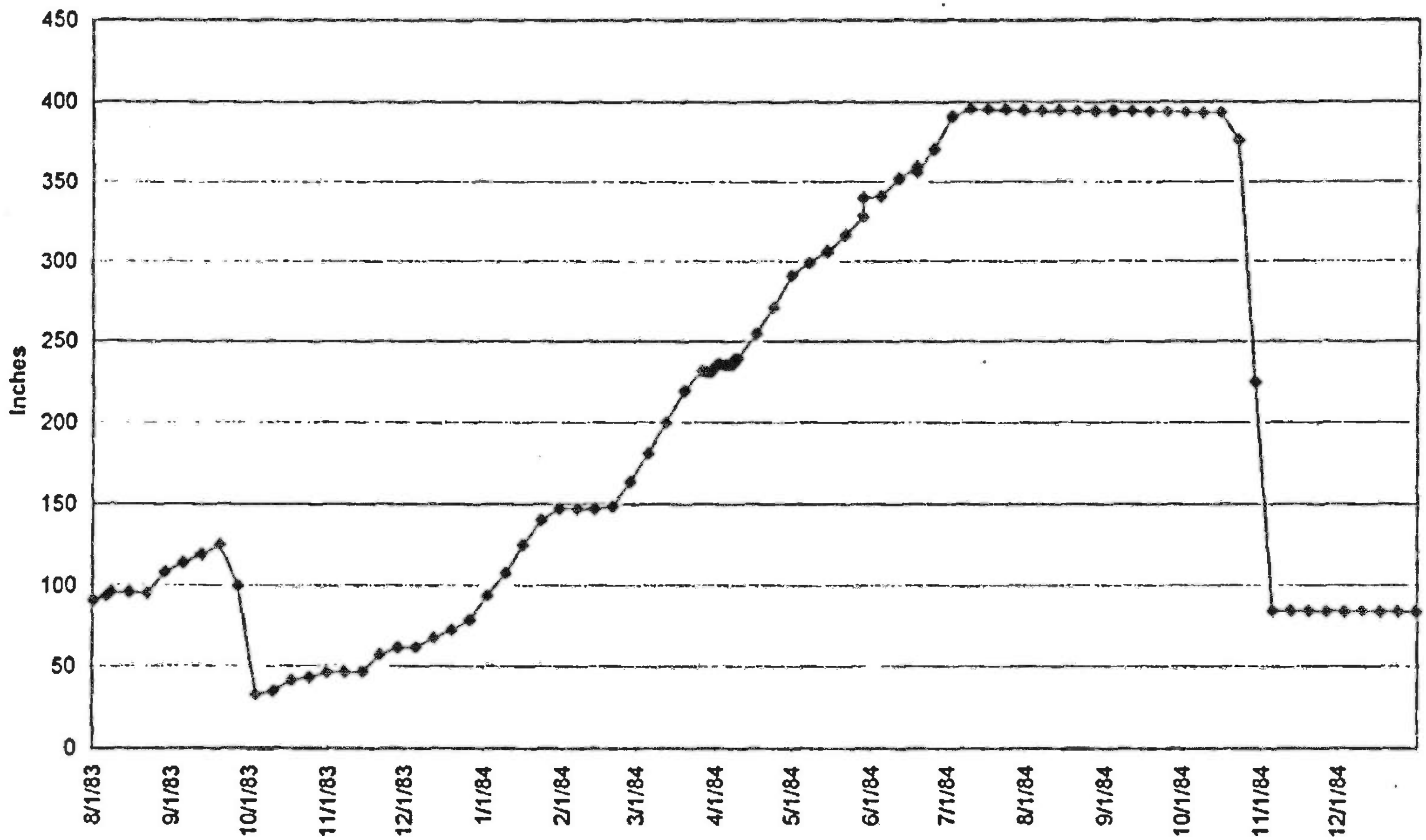


Figure B-3.

Tank 241-AW-103 Waste Surface Level
January 1985 - June 1987

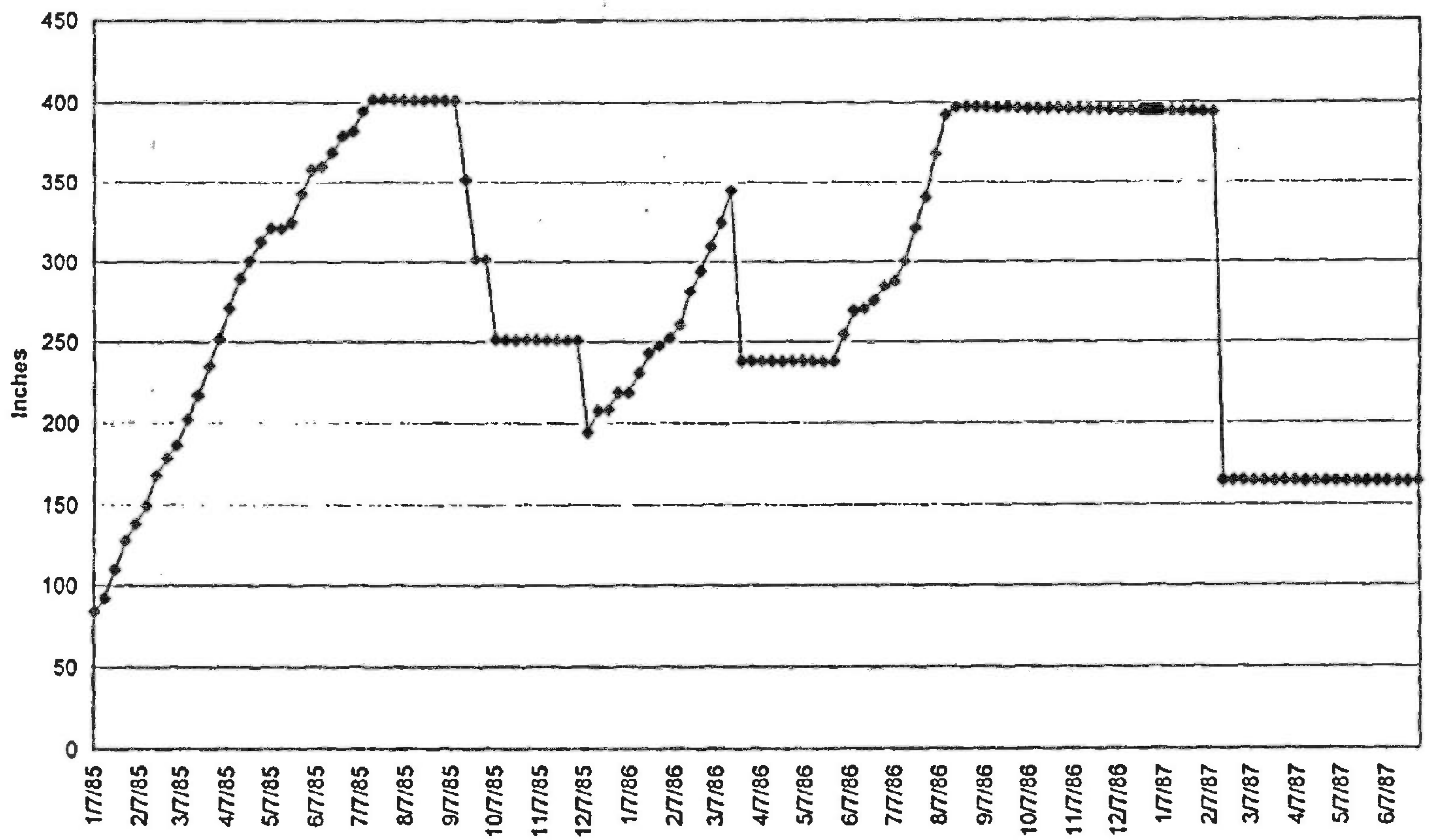


Figure B-4.

Tank 241-AW-103 Waste Surface Level
July 1987 - December 1989

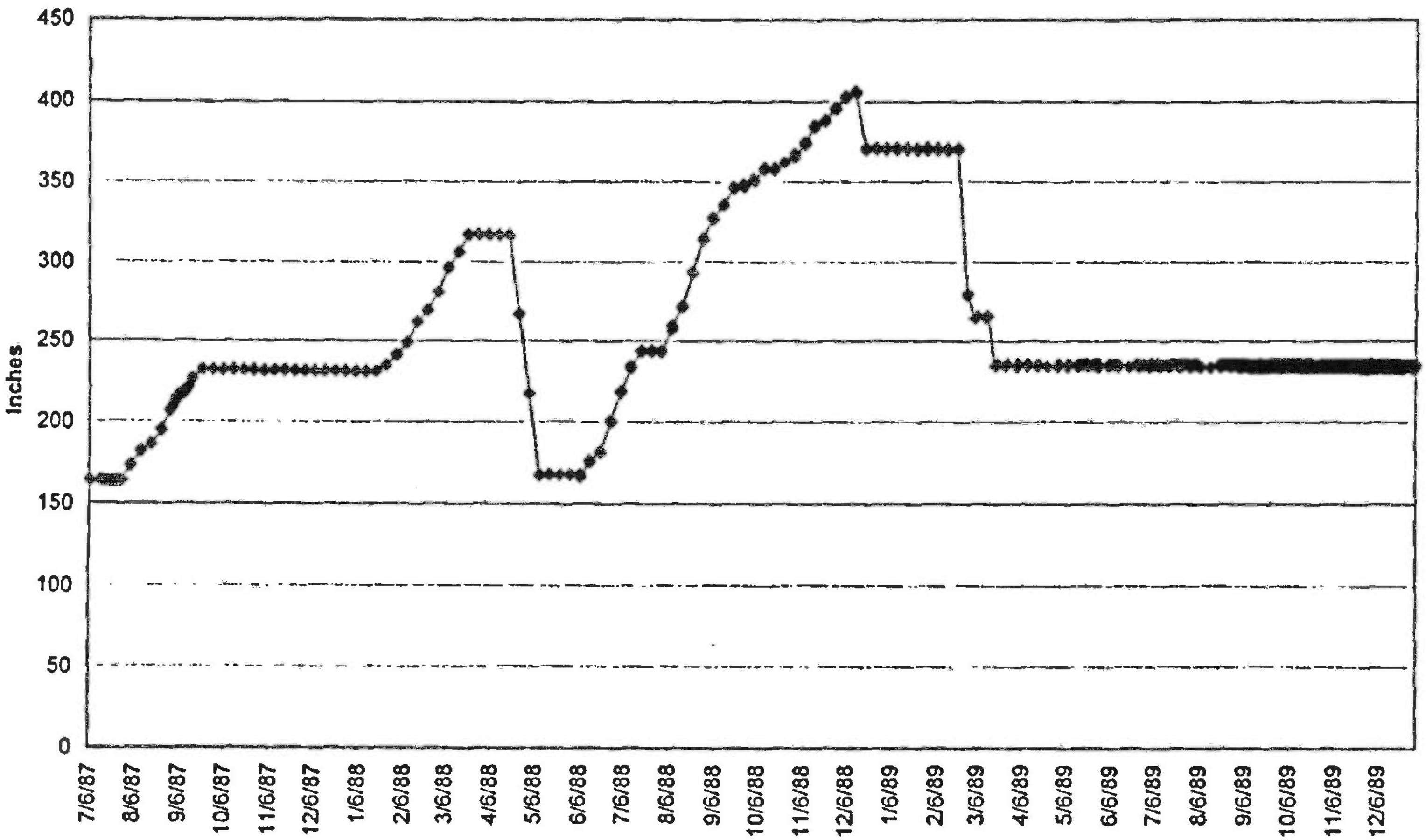


Figure B-5.

Tank 241-AW-103 Waste Surface Level
January 1990 - December 1993

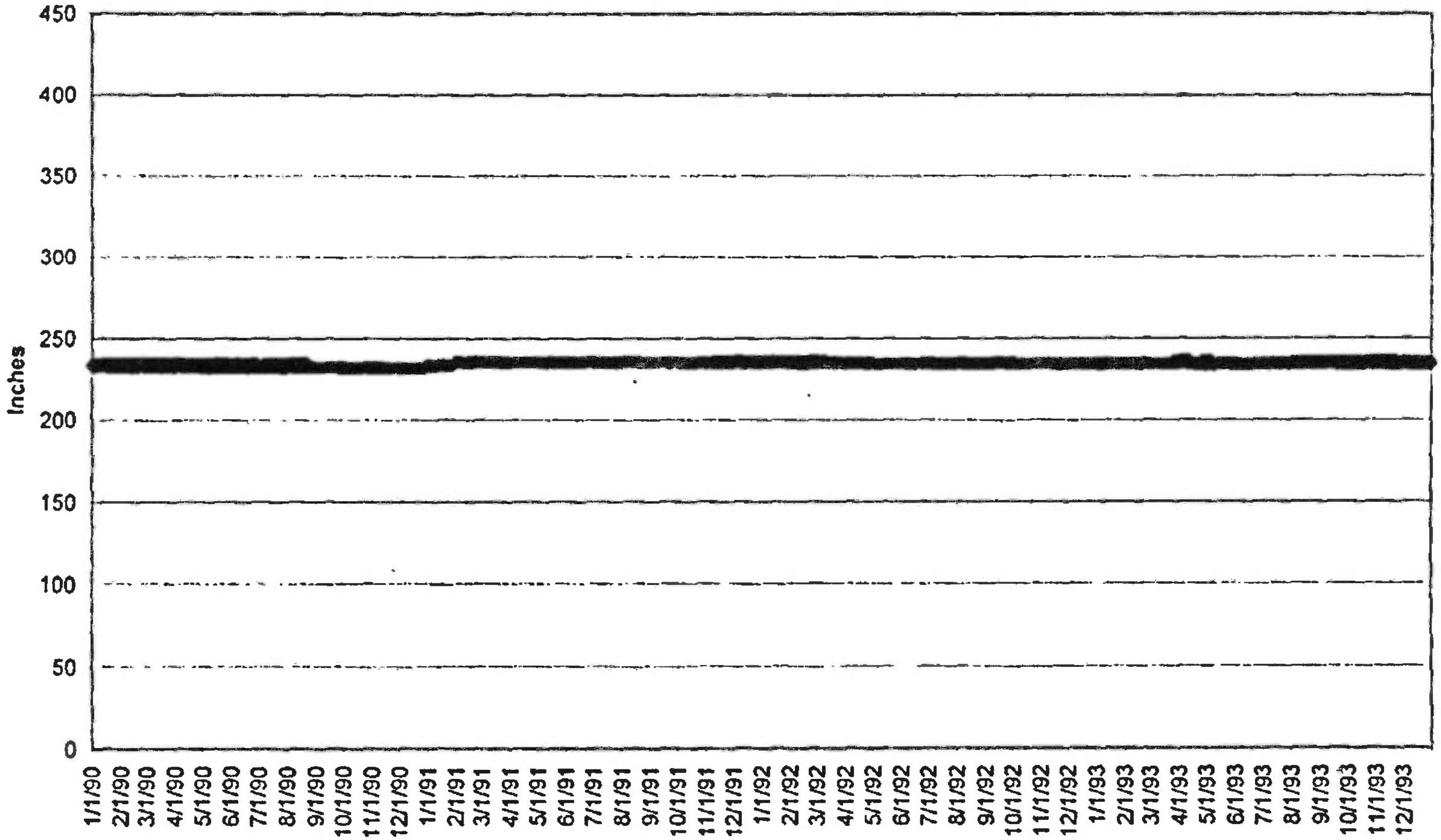


Figure B-6.

Tank 241-AW-103 Waste Surface Level
January 1994 - December 1996

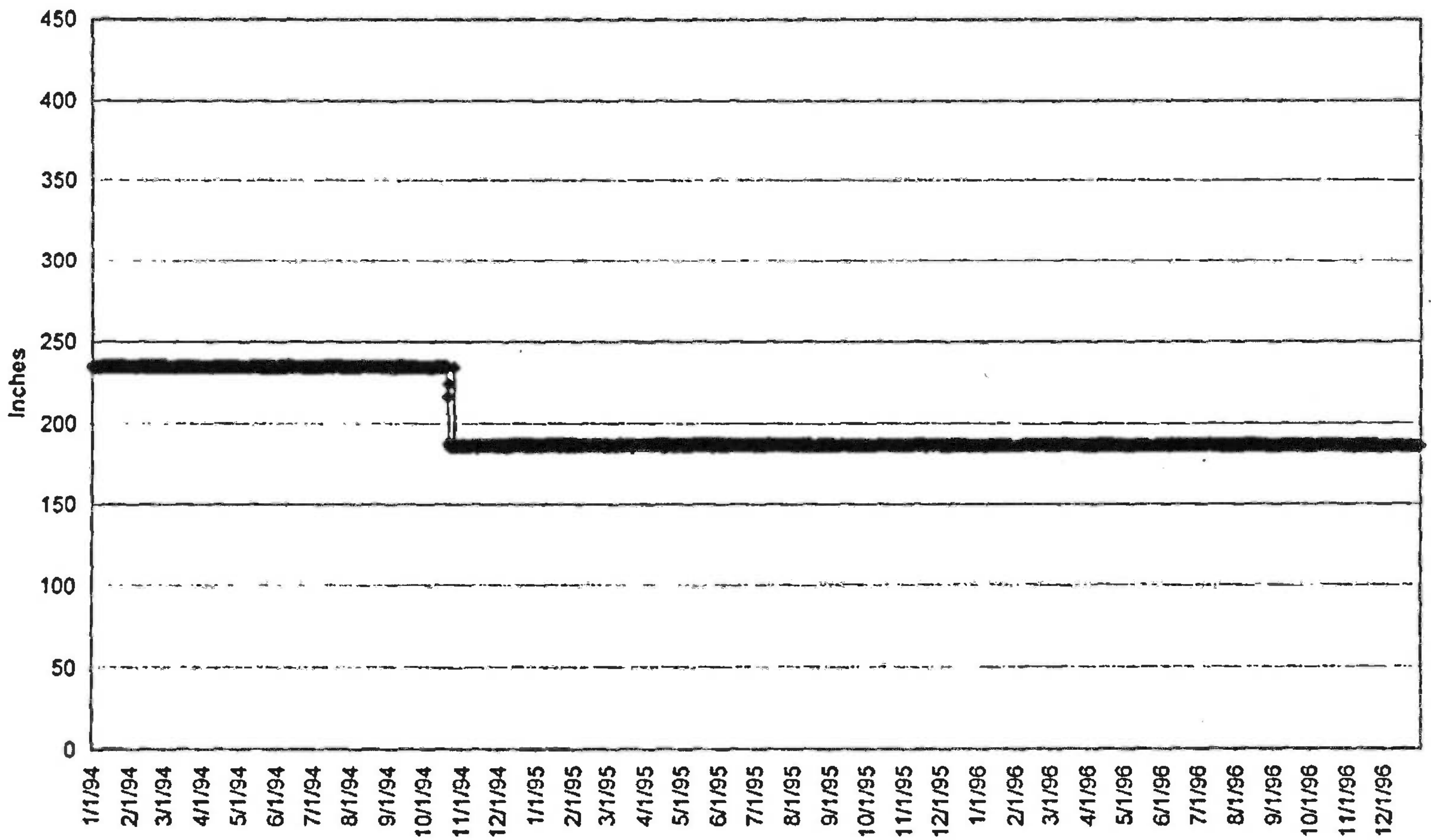


Figure B-7.

Tank 241-AW-103 Waste Surface Level
January 1997 - December 1999

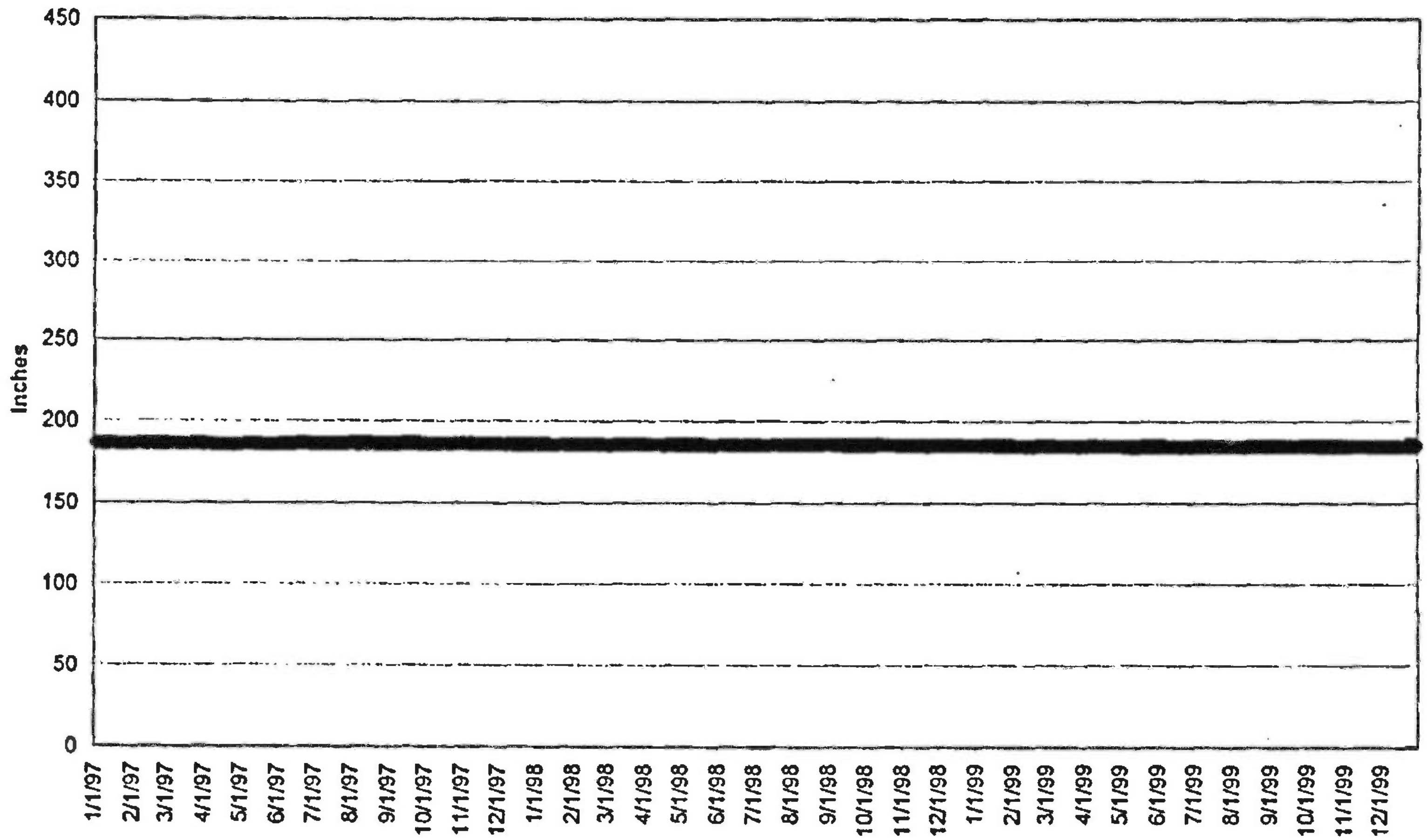
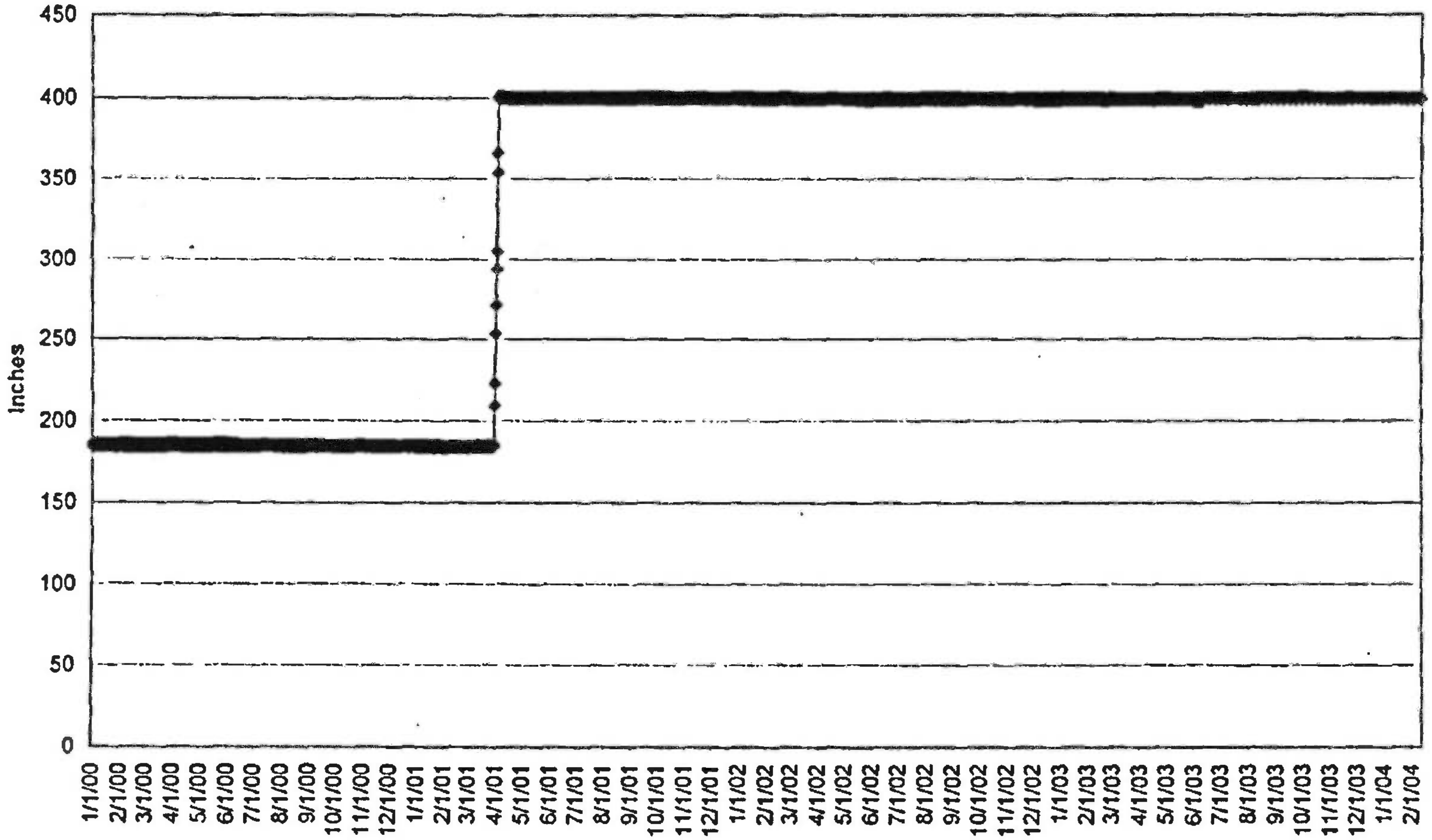


Figure B-8.

Tank 241-AW-103 Waste Surface Level
January 2000 - February 2004



DEC 15 2004
STA: 15 (65)

ENGINEERING DATA TRANSMITTAL

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Engineering	1. EDT 821321 1A. Page 1 of 1 4. Related EDT No.: N/A 7. Purchase Order No.: N/A
5. Proj./Prog./Dept./Div.: TRUM Waste Retrieval and Packaing	6. Design Authority/Resp. Engr./Design Agent: M. E. Johnson	9. Equip./Component No.: N/A 10. System/Bldg./Facility: N/A
8. Originator Remarks: This document descibes the origin of wastes contained in double-shell tank 241-AW-105 r Jole 12/15		12. Major Assembly Dwg. No.: N/A 13. Permit/Permit Application No.: N/A
11. Receiver Remarks:	11A. Design Basis Document? ☐ Yes ☒ No	14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Desig-nator	(G) Reason for Trans-mittal	(H) Origi-nator Dispo-sition	(I) Receiv-er Dispo-sition
1	RPP-RPT-23177	n/a	0 JL 12/15	Origin of Waste in Tank 241-AW-105	N/A	1	1	1

16. IMPACTED DOCUMENTS – NON ENGINEERING		17. IMPACTED DOCUMENTS – ENGINEERING	
Type of Document	Document Number	Type of Document	Document Number
N/A	N/A	N/A	N/A

18. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
See TFC-ESHQ-Q-INSP-C-05	1. Approval 2. Review 3. Post-Review	1. Approved 2. Approved w/comment 3. Reviewed no comment 4. Reviewed w/comment 5. Disapproved

19. SIGNATURE/DISTRIBUTION

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Auth.									
1	1	Resp. Engr. M. E. Johnson	M.E. Johnson	10/13/04	H6-19	1	1	David E. Place	David E. Place	10/18/04	R2-12
1	1	Resp. Mgr. D. J. Washenfelder	DJ Washenfelder	10/19/04	R2-58	1	1	J Kristofzski	[signature]	12/15/04	
		QA									
		Safety									
		Env.									
		Design Agent									

20.	21. DOE APPROVAL (if required)	22. STEWART MACKAY
M.E. Johnson 10/13/04 Signature of EDT Originator / Date	Ctrl. No.	S Mackay 12/15/04 Design Auth./Resp. Engr./Resp. Mgr. / Date

RPP-RPT-23177, Rev. 0

ORIGIN OF WASTE IN TANK 241-AW-105

M. E. Johnson
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 821321 UC:
Cost Center: 501546 Charge Code:
B&R Code: Total Pages: 97

Key Words: Hanford, double-shell tank, 241-AW-105, PUREX, Hot Semiworks, CX-70, REDOX process testing, neutralized cladding removal waste

Abstract: A review of waste transfer documentation was conducted to determine the origin of waste transferred into double-shell tank 241-AW-105. This review was conducted to support decisions concerning disposition of the waste present in this tank.

Janis Aardal 12-15-04
Release Approval Date

DEC 15 2004
DATE:
STA: 15
HANFORD RELEASE
ID: 65
Release Stamp

Approved For Public Release

EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into double-shell tank 241-AW-105. This review was conducted to support decisions concerning disposition of the waste present in this tank. Tank 241-AW-105 presently contains 264,000 gallons (~999,000 liters) of sludge and 157,000 gallons (~593,000 liters) of supernatant.

Tank 241-AW-105 entered service in 1980 and was first used to store concentrated complexant (CC) waste from operation of the 242-A Evaporator, double-shell slurry feed (DSSF), N reactor decontamination waste and miscellaneous low activity wastes from the PUREX Plant. With the exception of the sludge portion of the miscellaneous low activity PUREX Plant wastes, these wastes were removed in 1984 and the tank was then used from 1984 through 1988 to receive neutralized cladding removal waste (NCRW) from the PUREX Plant. Tank 241-AW-105 also received waste in 1988 from clean-out of tank CX-70 at the 201-C Hot Semi-Works facility and miscellaneous low activity wastes from the PUREX Plant from 1989 to 1990 and 1992 to 1996. The supernatant was periodically transferred from tank 241-AW-105 to other double-shell tanks for dispositioning.

The miscellaneous PUREX Plant wastes formed a sludge depositing in tank 241-AW-105. The NCRW also formed a sludge fraction that deposited atop the miscellaneous PUREX Plant waste in tank 241-AW-105. The NCRW sludge phase (926,000 liters) contains approximately 855 ηCi/gram TRU, as well as 39,200 Ci of ^{137}Cs and 8,630 Ci of ^{90}Sr. The miscellaneous PUREX Plant sludge phase (73,000 liters) contains approximately 2,075 ηCi/gram TRU, as well as 5,110 Ci of ^{137}Cs and 22,700 Ci of ^{90}Sr. The supernatant (593,000 liters) contains approximately 0.4 ηCi/gram TRU, as well as 5,920 Ci of ^{137}Cs and 13.1 Ci of ^{90}Sr. The volume and radionuclide content of these waste phases are based on the best basis inventory published in the Tank Waste Information Network System (http://twins.pnl.gov/twins.htm) as of October 13, 2004, with the radionuclides decay corrected to January 1, 2004.

TABLE OF CONTENTS

1.0 INTRODUCTION 7

2.0 WASTE TRANSFERS ASSOCIATED WITH TANK 241-AW-105 7

- 2.1 DESCRIPTION OF TANK 241-AW-105 7
- 2.2 WASTE TRANSFERS FOR TANK 241-AW-105 10
  - 2.2.1 CC Waste Receipt (August 1980 – November 1980) 10
  - 2.2.2 B Plant Waste Receipt (September 1982) 11
  - 2.2.3 Waste Transfer to Tank 241-AW-101 (April 1983) 12
  - 2.2.4 Miscellaneous PUREX Waste Receipt (April 1983 – July 1984) 13
  - 2.2.5 Tank 241-AW-103 Transfer to Tank 241-AW-105 (September 1983) 13
  - 2.2.6 NCRW Transfers (July 1984 – December 1988) 14
  - 2.2.7 Tank CX-70 Waste Transfers (March – July 1988) 16
  - 2.2.8 PUREX Stabilization Campaign (November 1989 – March 1990) 20
  - 2.2.9 PUREX Plant Decontamination (October 1993 – June 1996) 20
  - 2.2.10 Composition of Waste Stored in Tank 241-AW-105 21

3.0 WASTE GENERATED AT CHEMICAL PROCESSING PLANTS 26

- 3.1 PUREX PLANT 26
  - 3.1.1 Coating Dissolution 26
  - 3.1.2 Solvent Extraction 27
  - 3.1.3 Miscellaneous Plant Waste Solutions 28
- 3.2 242-A EVAPORATOR 28
- 3.3 221-B PLANT FISSION PRODUCTS PROCESSING 30
  - 3.3.1 STRONTIUM AND RARE EARTHS PROCESSING 31
  - 3.3.2 CESIUM AND STRONTIUM PROCESSING 32
- 3.4 HOT SEMIWORKS 33
- 3.5 100-N REACTOR DECONTAMINATION WASTE 37

4.0 SUMMARY 39

5.0 REFERENCES 40

APPENDICES

APPENDIX A TANK 241-AW-105 WASTE TRANSFER RECORDS A-1

APPENDIX B SURVEILLANCE ANALYSIS COMPUTER SYSTEM (SACS) SURFACE LEVEL MEASUREMENTS FOR TANK 241-AW-105 ..... B-1

FIGURES

Figure 1. Tank 241-AW-105 Cross Section 8
Figure 2. Aerial View of 241-AW Tank Farm 9
Figure 3 Tank CX-70 (Drawing H-2-4319) 19
Figure 4 242-A Evaporator 29
Figure 5 221-B Plant and WESF circa 1978 30
Figure 6 Hot Semiworks circa 1983 36
Figure 7. 204-S Tanker Car Unloading Facility 38
Figure 8. 204-AR Railcar Unloading Facility 38

TABLES

Table 1. Tank 241-AW-105 Supernatant Analysis (09/1982) 12
Table 2. Supernatant Transfers from Tank 241-AW-105 to 241-AW-102 15
Table 3. NCRW Fill Cycle for Tanks 241-AW-103 and 241-AW-105 15
Table 4. Tank CX-70 Supernatant Analysis (1974) 17
Table 5. Tank CX-70 Sludge Analysis (03/1976) 17
Table 6. Tank CX-70 Sludge Slurry Analysis (1985) 18
Table 7. Best Basis Inventory for Tank 241-AW-105 as of October 13, 2004 24
Table 8. Volume and Density of 241-AW-105 Waste Phases 25

LIST OF TERMS

A1SltCk	242-A Evaporator saltcake
BBI	Best-Basis Inventory
CC	complexant concentrate
CWZr2	Zirconium cladding waste
DSSF	double-shell slurry feed
FY	fiscal year
HLW	high-level waste
PUREX	plutonium-uranium extraction
NCRW	neutralized cladding removal waste
RHO	Rockwell Hanford Operations
RMIS	Record Management Information System
SACS	Surveillance Analysis Computer System
TCSRC	Tank Characterization and Safety Resource Center
TRU	transuranic
TWINS	Tank Waste Information Network System

Units

Ci	curies
ft	feet
g	grams
kgal	kilo-gallons
kL	kiloliters
m	meters
mL	milliliters
ηCi	nanocuries
μCi	micro-curies

1.0 INTRODUCTION

The origin of the waste in tank 241-AW-105 has been reviewed to provide information for determining the disposition of this waste. Section 2.0 discusses the origin of waste transferred into and removed from tank 241-AW-105. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to tank 241-AW-105. Section 4.0 summarizes the waste types that were transferred into tank 241-AW-105.

2.0 WASTE TRANSFERS ASSOCIATED WITH TANK 241-AW-105

This section provides a brief description of double-shell tank 241-AW-105 and summarizes waste transfers into and waste removal from this tank. In order to determine the origins of the waste presently stored in tank 241-AW-105, available reports for the Hanford Site and tank farm operating records were reviewed. Information reviewed included the Hanford Site contractors' monthly reports, tank farm waste status summary reports, waste transfer records, miscellaneous letters, and technical reports. The waste transfer records are available only as photocopies from the Tank Characterization and Safety Resource Center (TCSRC) located in 2750-E building.

2.1 DESCRIPTION OF TANK 241-AW-105

Tank 241-AW-105 is a double-shell tank that was constructed from 1976 to 1980. Double-shell tanks are constructed with a primary steel liner and an outer steel liner, both inside a reinforced concrete shell and covered by a concrete reinforced dome. The primary steel liner is separated from the outer steel liner by annulus, which is equipment with leak detection capability. Tank 241-AW-105 is one of the six tanks in the 241-AW Tank Farm, as shown in Figure 2. Tank 241-AW-105 has a maximum storage capacity of 4,390,000 liters (1,160,000 gallons), a diameter of 22.9 m (75.0 ft), and an operating depth of 10.7 m (35.2 ft). Figure 1 provides a plan view of tank 241-AW-105. Tank 241-AW-105 is equipment with fifteen 4-inch diameter risers, four 12-inch diameter risers, and three 24-inch diameter risers.

Figure 1. Tank 241-AW-105 Cross Section

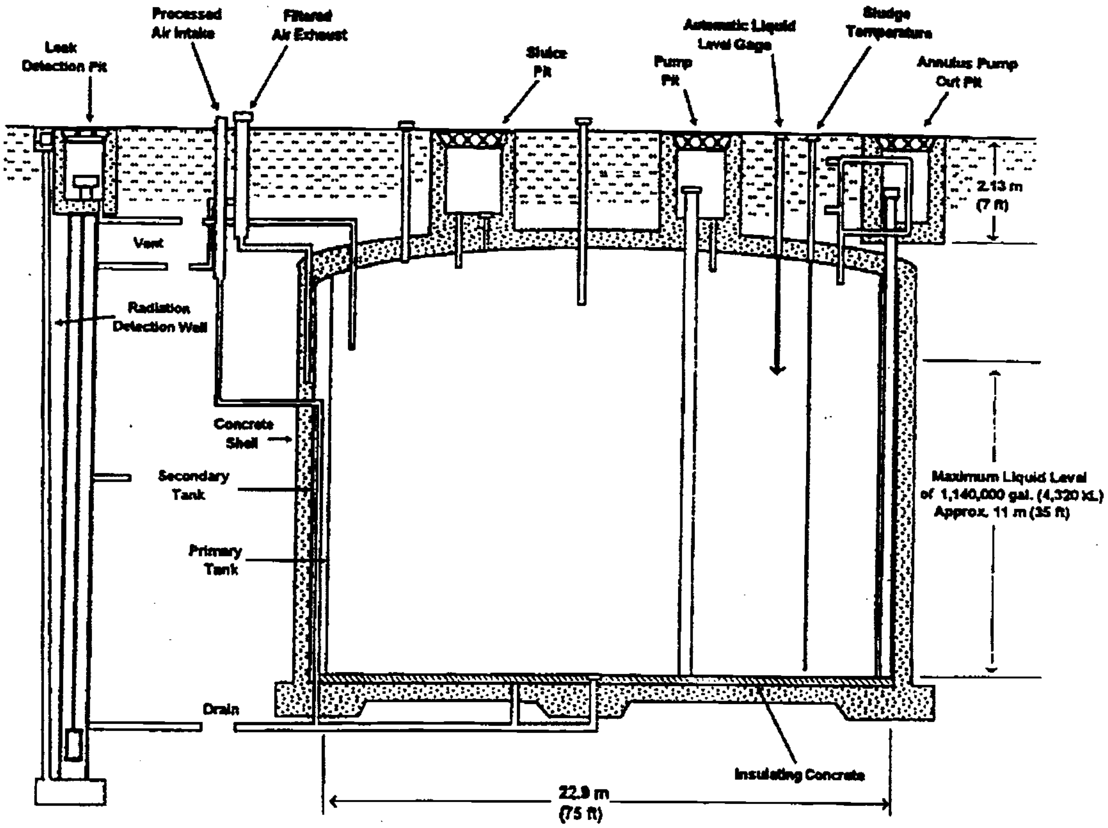
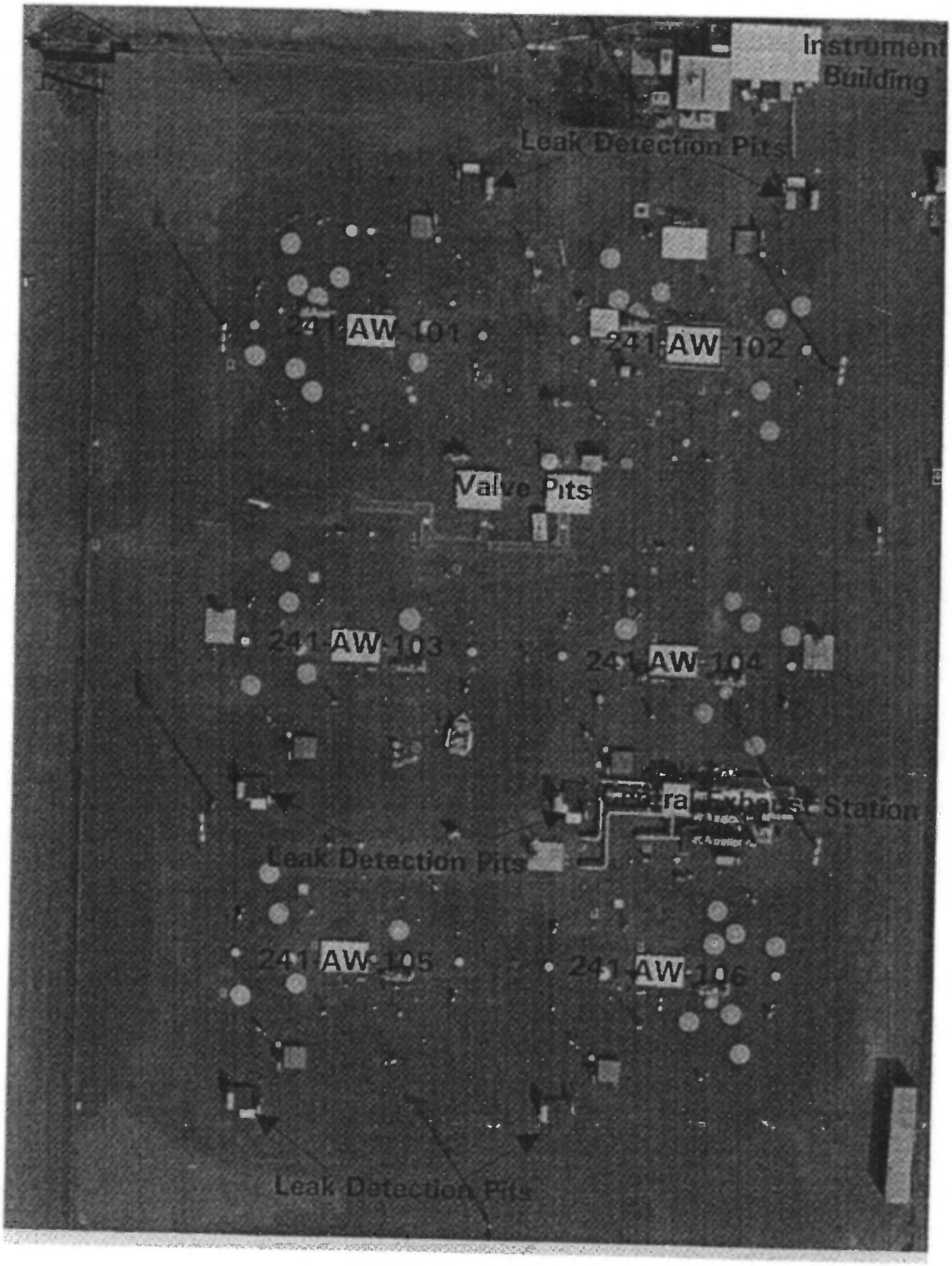


Figure 2. Aerial View of 241-AW Tank Farm



2.2 WASTE TRANSFERS FOR TANK 241-AW-105

This section describes the waste types that were transferred into and removed from tank 241-AW-105 from July 1980 to August 2004. Documentation of the waste transfer associated with tank 241-AW-105 are provided in Appendix A and B, along with the cited references. Appendix A provides a tabular listing of waste transfers associated with tank 241-AW-105. Appendix B provides a graphical representation of the waste level in tank 241-AW-105 for the period of July 1980 through August 2004. The waste level measurements for tank 241-AW-105 are from the Surveillance Analysis Computer System (SACS).

2.2.1 CC Waste Receipt (August 1980 – November 1980)

Tank 241-AW-105 went into service on July 1980. The tank contained approximately 3.75 inches (9,874 gallons) of water following operability testing.

A reported 919,180 gallons of concentrated complexant (CC) waste were slurried from the 242-A Evaporator (see section 3.2) during campaign 80-9 to tank 241-AW-105 from August 14, 1980 through August 27, 1980 (RHO-SD-WM-PE-005). The temperature of the CC waste averaged ~130°F when discharged from the evaporator. The tank was not filled to the maximum operating volume in order to allow for slurry growth of the CC waste. A measurement of the solids in tank 241-AW-105 was obtained in January 9, 1981 and determined to range from 0.8 inches (~1960 gallons) to 1.0 inch (~2470 gallons) (RHO-SD-WM-PE-005, page 12).

The complexed waste[1] that was concentrated during 242-A Evaporator campaign 80-9 was originally stored in tank 241-SY-103[2]. The CC waste was transferred to tank 241-S-107 where it was diluted at a ratio of 30 percent water to 70 percent waste and then pumped to tanks 241-A-101[3], 241-A-102[4], 241-BX-104[5] and 241-BX-105[6] for processing in the evaporator.

[1] Complexed waste is waste containing greater than 10 grams of carbon as total organic carbon per liter of waste.

[2] Tank 241-SY-103 went into service in 1977, receiving CC waste from the 242-S Evaporator. The CC waste originated from strontium solvent extraction processing conducted in the 221-B Plant.

[3] Tank 241-A-101 was placed in service in 1956 to receive high-level waste from the 202-A PUREX Plant. The tank continued to receive periodic transfers of PUREX high-level waste (HLW) and organic wash waste through early 1968. In the second quarter of 1968, through March 1969, the HLW supernatant and sludge in tank 241-A-101 was removed by sluicing (SD-WM-TI-302, page 159). The tank then was used to receive PUREX HLW and other miscellaneous wastes from other single-shell tanks. The supernatant was removed from the tank in fourth quarter of 1975 to allow for sluicing of the solids. Sluicing of the solids from tank 241-A-101 was conducted from the fourth quarter of 1975 through March 1976 (SD-WM-TI-302, page 159). A heel of less than 3-inches (~8,300 gallons) of PUREX HLW solids remained in tank 241-A-101 in April 1976 (ARH-LD-215B, page 26). Tank 241-A-101 was then used from 1976 through 1980 in conjunction with the 242-A Evaporator.

[4] Tank 241-A-102 was placed in service in 1956 to receive high-level waste from the 202-A PUREX Plant. The tank continued to receive periodic transfers of PUREX high-level waste (HLW) and organic wash waste through 1967. In 1968, through mid-1970, the tank was used receive HLW supernatant from other A Farm tanks and transfer this waste to tanks 241-C-105 for eventual transfer to B Plant for cesium ion

No additional waste was received into tank 241-AW-105 from September 1980 through August 1982. The Surveillance Analysis Computer System (SACS) liquid level measurements for tank 241-AW-105 (Appendix B, figure B-1) show a slight downward trend (reduction of 0.33-inches per month) in the liquid volume for tank 241-AW-105 which is indicative of waste cooling and water evaporation.

2.2.2 B Plant Waste Receipt (September 1982)

In September 1982, approximately 113,850 gallons of waste from waste was transferred from tank 241-AW-104 into tank 241-AW-105, filling this tank to 378.2 inches (RHO 1982). Tank 241-AW-104 was empty until receiving ~143,000 gallons of cesium ion exchange waste and low-level waste from 221-B Plant (see section 3.3) via tank 241-AY-101 in August 1981 (RHO 1982). No additional waste was added to tank 241-AW-104 before transferring the 221-B Plant cesium ion exchange waste and low-level waste to tank 241-AW-105.

A sample of the supernatant contained in tank 241-AW-105 was obtained and analyzed in September 1982, with the results reported in Table 1 (65453-82-345). No waste additions or removals from tank 241-AW-105 occurred from October 1982 through March 1983. Tank 241-AW-105 was reported to contain no solids as of March 31, 1983 (RHO-RE-SR-14 March 1983, page 12).

---

exchange (IX) processing. In late 1970, dilute waste was added to the sludge in tank 241-A-102 to remove soluble salts and cesium. The supernatant was then transferred to B Plant as before for cesium IX processing. The sludge in tank 241-A-102 was removed by sluicing (SD-WM-TI-302, page 160) from July 1972 through May 1973. The tank then was used to receive dilute wastes from the B Plant cesium IX process. The tank was again sluiced in early 1976 (SD-WM-TI-302, page 160). A heel of less than 2-inches (~5,520 gallons) of PUREX HLW solids remained in tank 241-A-102 in May 1976 (ARH-LD-217B, page 13). Tank 241-A-102 was then used from 1976 through 1980 in conjunction with the 242-A Evaporator.

[5] Tank 241-BX-104 was placed in service in 1949 and was used until early 1955 to store metal waste from the 221-B Bismuth Phosphate Plant. The metal waste was removed by sluicing the tank contents in 1954. In 1956, this tank was used to stored waste from the 221-U Tri-Butyl Phosphate Plant, which was discharged to the BC ditch in late 1956. The tank sat empty (waste heel of ~62 kgal) from 1957 through late 1962. Tank 241-BX-104 was then used to store coating removal waste (CW) from the PUREX Plant. The PUREX CW was removed in late 1967 and tank 241-BX-104 was then used through 1970 to store cesium ion exchange waste from 221-B Plant. The cesium ion exchange waste was removed in late 1970 and tank 241-BX-104 was used through late 1972 to receive and transfer to 221-B Plant, REDOX high-level waste supernatant for cesium ion exchange processing. Tank 241-BX-104 was again used through mid-1976 to store cesium ion exchange waste from 221-B Plant. From mid-1976 through 1978, tank 241-BX-104 was used to transfer waste from the 200 West Area to the 200 East Area and dilute customer wastes (i.e. reactor decontamination waste) for staging to the 242-A Evaporator.

[6] Tank 241-BX-105 was placed in service in 1949 and was used until early 1954 to store metal waste from the 221-B Bismuth Phosphate Plant. The metal waste was removed by sluicing the tank contents in 1954. In 1956, this tank was used to stored waste from the 221-U Tri-Butyl Phosphate Plant, which was discharged to the BC ditch in early 1957. The tank sat empty (waste heel of ~62 kgal) from 1957 through 1963. Tank 241-BX-105 was then used to store coating removal waste (CW) from the PUREX Plant. The PUREX CW was removed in 1968 and tank 241-BX-105 was then used through early 1974 to store cesium ion exchange waste from 221-B Plant. The cesium ion exchange waste was removed in early 1974 and tank 241-BX-105 was used through mid-1976 to store evaporator bottoms from the in-tank solidification unit. From mid-1976 through 1978, tank 241-BX-105 was used for staging waste to the 242-A Evaporator.

2.2.3 Waste Transfer to Tank 241-AW-101 (April 1983)

In April 1983 (refer to Appendix A, Table A-1), the waste contained in tank 241-AW-105 was transferred to tank 241-AW-101 (65950-83-1004) for staging as feed at a later date to the 242-A Evaporator (RHO-SD-WM-PE-017). A heel of approximately 18.8 inches (~51,000 gallons) of dilute B Plant wastes was left in tank 241-AW-105 following this transfer. No solids were reported in tank 241-AW-105 at the end of April 1983 (RHO-RE-SR-14 April 1983, page 12).

Table 1. Tank 241-AW-105 Supernatant Analysis (09/1982)

Analyte	Units	Concentration
Pu	ηCi/gram	7.9[(1)]
Am-241	ηCi/gram	121
Tc-99	ηCi/gram	78
HEDTA	M	0.1044
EDTA	M	0.0323
Sr-90	µCi/L	9.1E+03
Cs-137	µCi/L	2.37E+05
OH	M	0.647
TOC	gm/L	34.8
Na	M	8.52
Al	M	0.506
F	M	0.027
Sp. Gr.		1.356
Solids	Wt%	0

[(1)] The Pu was apparently present as a colloidal suspension and representative sub-sampling was difficult to obtain. Duplicate analysis yielded 107ηCi/gram.

2.2.4 Miscellaneous PUREX Waste Receipt (April 1983 – July 1984)

From April 1983 through July 4, 1984, waste from miscellaneous low activity waste from the PUREX Plant (see section 3.1) collected in tanks F-18, R-8 and G-8 were transferred into tank 241-AW-105. PUREX tanks G-8 and R-8 collected organic solvent wash solutions (RHO-SD-RE-PCP-006, page 24). PUREX tank F-18 collected miscellaneous sump wastes consisting of cooling water, steam condensate, chemicals, or other low activity leaks in process cells (RHO-SD-RE-PCP-006, page 24). The miscellaneous sump wastes were neutralized with sodium hydroxide solution and transferred to underground storage tanks. Solids precipitated from the PUREX Plant miscellaneous low activity wastes in tank 241-AW-105. In particular, organic solvent wash wastes contained sodium oxalate, sodium carbonate, uranium, iron and manganese which likely contributed to most of the precipitated material.

Tank 241-AW-105 received a total of ~2.74 million gallons of miscellaneous low activity wastes from the PUREX Plant during this period, as indicated in Appendix A, Table A-1. The miscellaneous low activity wastes collected in tank 241-AW-105 were periodically transferred to other double-shell tanks for dispositioning. Tank 241-AW-105 contained ~101,400 gallons of miscellaneous low activity waste from the PUREX Plant on July 4, 1984. The solids volume reported in tank 241-AW-105 at the end of June 1984 was 14,000 gallons (RHO-RE-SR-14 June 1984, page 12).

2.2.5 Tank 241-AW-103 Transfer to Tank 241-AW-105 (September 1983)

The 202-A PUREX Plant had been idle from September 1972 through March 1983. During this period, new double-shell tanks had been constructed in 241-AW Tank Farm. Waste transfer lines from the PUREX Plant were constructed to some of these double-shell tanks. Operability testing of the waste transfer lines from the PUREX Plant to the 241-AW Tank Farm was conducted from April 14 to June 10, 1983 (RHO-SD-RE-OTR-009).

Approximately 1,925 gallons of waste were transferred from PUREX tank E-5 to tank 241-AW-103 on April 25, 1983 during operability testing of the waste transfer lines. An additional ~127,000 gallons of waste was transferred from the PUREX Plant to tank 241-AW-103 as part of pre-operational testing activities. Tank 241-AW-103 contained a total of ~342,700 gallons of waste following the completion of the pre-operational testing activities at the PUREX Plant. The waste in tank 241-AW-103 was a mixture of the PUREX Plant pre-operational testing waste, 100-N Reactor decontamination (see section 3.5) and double-shell slurry feed (DSSF) waste from 242-A Evaporator campaigns 80-8, 80-10, and 81-1 (RHO-SD-WM-PE-004, RHO-SD-WM-PE-006, and RHO-SD-WM-PE-007).

After completing the operability testing activities at the PUREX Plant, approximately 264,000 gallons of supernatant was transferred from tank 241-AW-103 to tank 241-AW-105 in September 1983 (65950-83-998PM) and mixed with the miscellaneous PUREX Plant low activity wastes stored in tank 241-AW-105 (see section 2.2.4).

2.2.6 NCRW Transfers (July 1984 – December 1988)

At the Hanford Site, the first step in reprocessing irradiated nuclear fuel elements involved the chemical dissolution of the cladding that surrounded the uranium fuel elements. The cladding was chemically dissolved in a chemical solution that minimized the dissolution of the irradiated uranium fuel element and the fission products trapped in the fuel element. The entrained solid material was separated using centrifuges. The cladding solution was neutralized with a caustic solution and then transferred to underground storage tanks. The neutralized cladding removal waste from dissolution of Zircaloy®[7] clad fuel elements was designated as NCRW. Zircaloy® clad fuel elements were primarily processed in the 202-A PUREX Plant at the Hanford Site. NCRW was collected in PUREX tank E-5 and then transferred to underground storage tanks. Section 3.1 provides further discussion of the PUREX Plant.

Tanks 241-AW-103 and 241-AW-105 were used to receive NCRW from October 1983 through December 1988. Approximately 2.55 million gallons of NCRW was transferred to tank 241-AW-105 from July 1984 through December 1988, as detailed in Appendix A-1, Table A-1 and Appendix A-2, Table A-2. The dates that tanks 241-AW-103 and 241-AW-105 were used to receive NCRW are listed in Table 3 (letters 65611-86-118 and 65611-87-090).

Tank 241-AW-105 also received salt well liquor[8] and water flushes from the 244-BX double-container receiver tank (DCRT) during April through July 1985. DCRT 244-BX received salt well liquor from single-shell in the 241-B, 241-BX and 241-BY tank farms. The records differ on the quantity of salt well liquor received into tank 241-AW-105, varying from ~77,300 gallons (based on the Tank Farm Daily Operating Reports) to 130,000 gallons (based on Appendix A-2). The difference is due to water dilution added to transfer the salt well liquor and flush the transfer line.

When tank 241-AW-105 was not receiving NCRW, the NCRW solids were allowed to settle to the bottom of the tank and a clarified supernatant layer formed. The supernatant was then periodically transferred from tank 241-AW-105 to tank 241-AW-102, as listed in Table 2[9].

The PUREX Plant ceased operations in December 1988, followed by a stabilization campaign (see section 2.2.8). In December 1988, the total volume of waste in tank 241-

[7] Zircaloy® is a trademark of Teledyne Wah Chang, Albany, Oregon.

[8] Wastes in some single-shell tanks were concentrated to the point of saturation where salts would precipitate. The saturated solution remaining atop the precipitated salts was removed along with as much as practical of the interstitial liquid contained in the precipitated salts. The saturated salt solution and interstitial liquid was known as salt well liquor.

[9] The dates and volumes of supernatant transferred from tank 241-AW-105 differ slightly than the values presented in Appendices A-1 and A-2. These differences are due to the source data used to prepare Table 2 and Appendices A-1 and A-2.

AW-105 was approximately 830,000 gallons of which 297,000 gallons were identified as sludge (WHC-EP-0182-9, page F-3).

Table 2. Supernatant Transfers from Tank 241-AW-105 to 241-AW-102

Dates	Volume Transferred (kgal)	Reference
December 9, 1985 to December 28, 1985	484	RHO-SD-WM-PE-026, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-1 Post Run Document*
May 15, 1986 to May 20, 1986	390	RHO-SD-WM-PE-031, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-4 Post Run Document* (transfer volume listed as 374 kgal from 5-30-86 to 6-2-86)
August 15, 1987 September 1, 1987 to September 5, 1987	633 (returned 613)	WHC-SD-WM-PE-033, *242-A Evaporator / Crystallizer FY 1987 Campaign Run 87-3 Post Run Document*: ~632 kgal of NCRW supernatant transferred from tank 241-AW-105 on August 27, 1987. ~668.6 kgal of NCRW supernatant + flush returned from tank 241-AW-102 to tank 241-AW-105 (9-8-87 to 9-13-87) due to high ammonium hydroxide concentration in evaporator process condensate.
February 15, 1988	72	*Daily Operating Report Tank Farm Processing Operations January – December 1988*, (TCSRC) and Letter 13331-87-975
March 15, 1988	228	*Daily Operating Report Tank Farm Processing Operations January – December 1988*, (TCSRC): daily operating reports indicate transfer occurred from March 1 to March 7, 1988 and volume was ~201,180 gallons.
April 15, 1988	275	*Daily Operating Report Tank Farm Processing Operations January – December 1988*, (TCSRC): daily operating reports indicate transfer occurred from April 6 to April 7, 1988 and volume was ~276,150 gallons.

Table 3. NCRW Fill Cycle for Tanks 241-AW-103 and 241-AW-105

Date	NCRW Receiver Tank
May 1983 – September 1983 (Pre-PUREX Start-up)	241-AW-103
October 1983 – July 4, 1984	241-AW-103
July 4, 1984 – January 9, 1985	241-AW-105
January 9, 1985 – June 15, 1985	241-AW-103
June 15, 1985 – December 10, 1985	241-AW-105
December 10, 1985 – March 19, 1986	241-AW-103
March 19, 1986 – May 29, 1986	241-AW-105
May 29, 1986 – August 21, 1986	241-AW-103
July 1986 – July 1987	241-AW-105
August 2, 1987 – March 1988	241-AW-103
May 1988 – December 1988	241-AW-105
June 1988 – December 1988	241-AW-103

2.2.7 Tank CX-70 Waste Transfers (March – July 1988)

Tank CX-70 is located in the 241-CX tank farm adjacent to the former 201-C Hot Semiworks facility in the 200 East Area of the Hanford Site. Tank CX-70 was installed in 1951 to receive waste from testing the REDOX process flowsheet conducted at the Hot Semiworks facility from November 1952 to October 1953. Section 3.4 provides further discussion on the processes conducted at the 201-C Hot Semiworks. Two other waste storage tanks are also located in the 241-CX tank farm and are identified as CX-71 and CX-72, but were installed at a later date and used in conjunction with testing of the PUREX process conducted at the Hot Semiworks from May 1955 through March 1956.

Tank CX-70, as shown in Figure 3 is a vertical cylindrical, concrete tank with a stainless-steel liner covering the entire interior surfaces of the concrete. The tank inside diameter is 20 ft with an inside height of 15 ft. The tank operating volume is 31,000 gallons measured from a point 1 ft. from the top of the tank. The tank is equipped with a 10 inch, stainless steel vent line that enters the top of the tank and makes an S-bend about halfway from the tank top to the surface grade level. The vent line bend and line below the bend are encased in concrete. A fiberglass filter was originally attached to the vent line for tank CX-70 (HW-22955, pages 1-405.5-1 thru 1-405.5-3).

This tank was designed to receive and store wastes generated from testing of the REDOX[10] process chemical flowsheet that was conducted at the 201-C Semiworks from November 1952 to October 1953. REDOX process wastes included the coating removal waste from dissolution of the aluminum coating on uranium fuel elements and fission products separated from the dissolved fuel elements. Tank CX-70 was reported to have received a total of 94,951 liters (25,086 gallons) of wastes containing 942.98 pounds of uranium and 226.64 grams of plutonium (HW-52860, page 56). Large volumes of decontamination solutions containing oxalic acid, caustic-permanganate, caustic tartaric and other chemicals were also reported to have been routed to tank CX-70 (Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72, letter dated July 2, 1974 from J. A. Teal to D. G. Harlow, Atlantic Richfield Hanford Company). After filling with the REDOX process test wastes and decontamination solutions, tank CX-70 was left undisturbed until 1979.

The estimated supernatant and sludge volumes in tank CX-70 were 21,300 and 10,700 gallons on May 1, 1974. The supernatant was sampled in 1974 with the analyses reported in Table 4. In 1979, the supernatant was removed from tank CX-70 to tank 011-CR in the 244-CR Vault and then to tank 241-C-104, leaving ~10,300 gallons of sludge in this tank.

[10] The REDOX (Reduction Oxidation) process was the second generation process used to separate plutonium and uranium from dissolved, irradiated uranium fuel elements. The REDOX process was the first solvent extraction process. Hexone and methyl isobutyl ketone were used to extract plutonium and uranium. The REDOX process was conducted at the 202-S REDOX Plant from January 1952 through December 1967 (RHO-CD-505 RD).

The sludge contained in tank CX-70 was sampled and analyzed in 1976, with the results reported in Table 5 (MEM-041576). The sludge in tank CX-70 was sampled again in 1985 with the analyses reported in Table 6 (Letter no. 65453-85-235 and 65453-85-246). Based on the 1985 sludge sample analyses, the transuranic concentration (i.e. plutonium) of the sludge in tank CX-70 was ~205 ηCi/gram of sludge and the sludge contained a total of ~495 Ci ^{137}Cs and 2,920 Ci ^{90}Sr.

From March through July 1988, approximately 10,050 gallons of sludge contained in tank CX-70 were sluiced using 140,000 gallons of water to tank 241-AW-105 (WHC-SD-DD-TI-057, page 25, WHC-SD-DD-TI-034 and *Daily Operating Report Tank Farm Processing Operations January – December 1988,* (TCSRC)). The 250 gallons of sludge and 500 gallons of water remaining in tank CX-70 were drummed and transferred to the Hanford Site Central Waste Complex in 1992 (WHC-SD-EN-ES-040, page 2-24).

Table 4. Tank CX-70 Supernatant Analysis (1974)

Analyte	Units	Concentration
Pu	gram/gallon	9.24E-05
Sr-90	µCi/gallon	3.23E+02
Cs-137	µCi/gallon	5.79E+04
U	Gm/gallon	5.67
pH		9.65

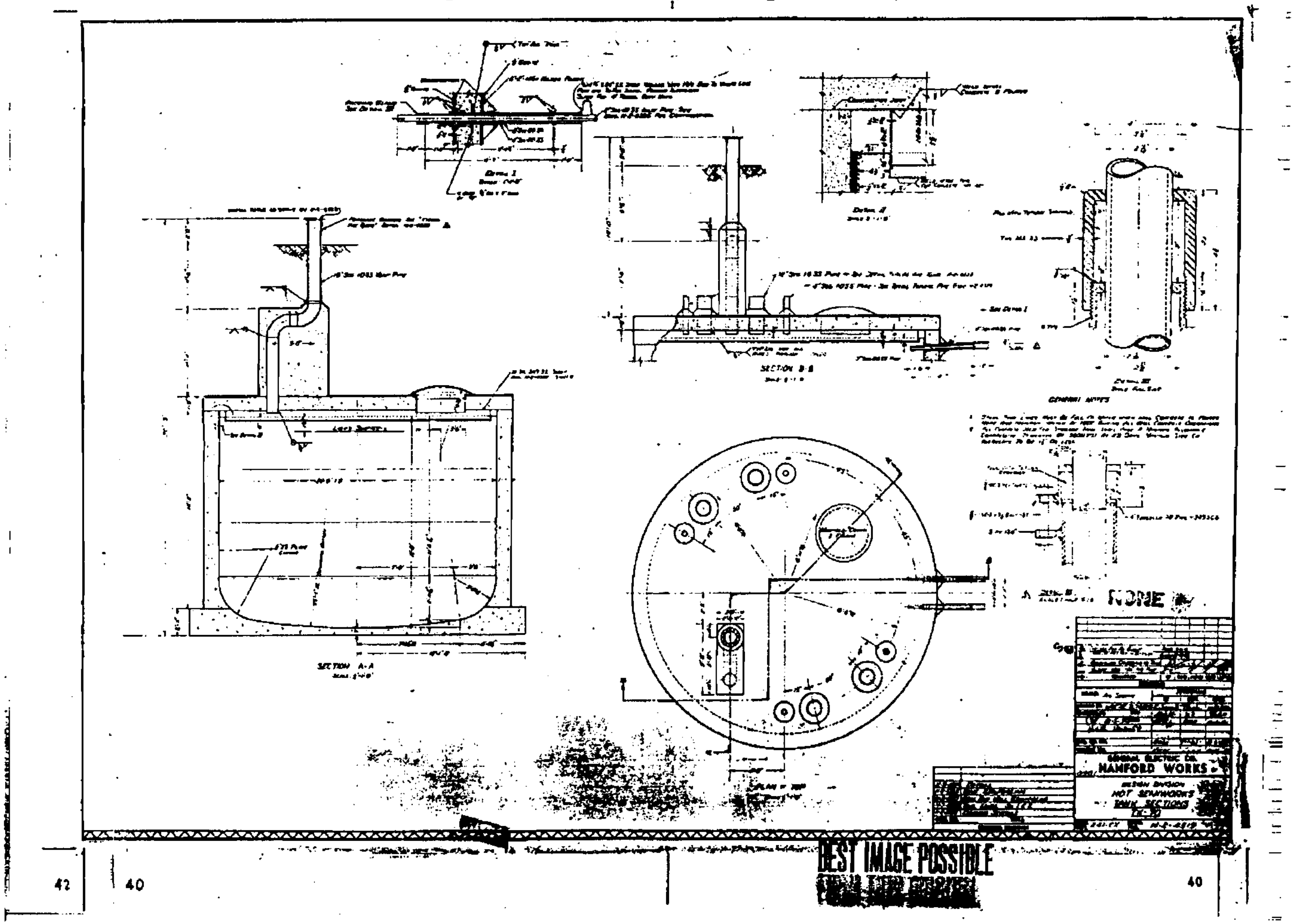
Table 5. Tank CX-70 Sludge Analysis (03/1976)

Analyte	Units	Concentration
Pu	gram/liter	1.35E-03
Sr-90	µCi/L	1.05E+05
Cs-137	µCi/L	2.15E+04
% H2O	Wt%	58.3
Al	M	6.4
Fe	M	0.4
Na	M	3.2
Ni	M	0.8
NO3	M	1.4
Mg	M	0.02
Mn	M	0.3
PO4	M	0.1
Si	M	0.4
Sp. Gr.		1.35
Particle density	gm/ml	2.74

Table 6. Tank CX-70 Sludge Slurry Analysis (1985)

Analyte	Units	Concentration
Na	M	3.42
Mn	M	0.17
Fe	M	0.14
Al	M	0.79
Ca	M	0.04
Cr	M	0.03
P	M	0.06
K	M	0.05
Si	M	0.03
Ni	M	0.01
Mg	M	0.015
PO4	M	0.071
SO4	M	0.059
TOC	gm/L	0.598
Total alpha	µCi/L	335
Cs-137	µCi/L	1.27E+04
Sr-90	µCi/L	7.49E+04
Pu-239/240	µCi/L	253
Volume Settle Solids	Volume %	90
Sp. Gr.		1.236

Figure 3 Tank CX-70 (Drawing H-2-4319)



2.2.8 PUREX Stabilization Campaign (November 1989 – March 1990)

Following shutdown of the PUREX Plant in December 1988, there remained an inventory of approximately 90.7 metric tons of irradiated uranium material left in the facility. The PUREX facility conducted a stabilization campaign from November 1989 through March 1990 to reduce the inventory of nuclear materials and to place various internal systems into a stable configuration (HNF-SP-1147, page 1).

The stabilization campaign generated NCRW waste batches that were transferred to tank 241-AW-105 during this period. No other PUREX waste types were transferred to tank 241-AW-105 during the PUREX facility stabilization campaign.

Following the completion of the stabilization campaign, the PUREX facility contained approximately 9-kgs of plutonium in oxide form, 9-kgs of plutonium and 5.3 MT of uranium in the recycled uranium nitrate solution, 1,100 gallons of neptunium bearing solution[11], plutonium bearing sludges and solids on various cell floors, 2.9 tons of aluminum clad fuel, 50 zirconium clad fuel elements[12], 180,000 to 200,000 gallons of contaminated nitric acid[13], and 21,000 gallons of organic solvent[14]. The solvent extraction columns were drained and did not contain solvent (HNF-SP-1147, pages 1-5).

The PUREX Plant then entered a standby period from March 1990 through December 1992. Planning for decontamination of the PUREX Plant ensued during the later part of this period.

2.2.9 PUREX Plant Decontamination (October 1993 – June 1996)

Deactivation of the PUREX Plant occurred from October 1993 through June 1996. Deactivation activities involved flushing canyon vessels, equipment and cells to remove the majority of the remaining special nuclear materials (i.e. uranium, plutonium and neptunium) and fission products. Details on the PUREX and UO_3 Plant deactivation can be found in HNF-SP-1147.

[11] The neptunium bearing solution was transferred to tank 241-AZ-102 on January 13, 1993 (E-mail 1996, "Np Transfer to AZ-102").

[12] The aluminum clad and zirconium clad fuel elements were transferred to the 105-K West Basins for storage along with an existing inventory of spent fuel elements in the fall of 1995 (HNF-SP-1147, pages 88-92).

[13] The contaminated nitric acid solution was transferred to the BNFL facilities in Sellafield U.K. from May 1995 through November 1995 (HNF-SP-1147, pages 92-93). BNFL used the nitric acid in their processing facilities and later returned to the Hanford site uranium that been contained in the contaminated nitric acid.

[14] The organic solvent was shipped to a co-generation facility in Tennessee operated by Diversified Scientific Services Incorporated. The solvent was burned to produce electricity in the co-generation facility (HNF-SP-1147, pages 93-97).

Liquid wastes generated from PUREX Plant deactivation included (WHC-SP-1011, pages 7.3-5 and 7.3-6):

- Flush and decontamination solutions from canyon process cells, vessels and sample gallery floor drains
- Vessel ventilation system condensate
- Sample header and condensate ventilation header drainage
- Rain water intrusion into the 241-A-151 diversion box collected in catch tank 241-S-302-A
- Pipe and operating gallery and sample gallery floor drains
- Steam condensate and rain water collection in PUREX tank P1
- PUREX analytical laboratory waste
- Laboratory vacuum pump seal water
- Rain water intrusion into the PUREX U cell sumps
- PUREX canyon exhaust stack condensate and flush water
- Acid fractionator building sumps
- PUREX storage tunnel sumps

The PUREX Plant deactivation wastes were collected in tank 241-AW-105. Tank 241-AW-105 also received in April 1995 transfers of canyon flush solutions mixed with plutonium and uranium solutions that were leftover from the stabilization campaign (HNF-SP-1147, page 87).

The waste supernatant collected in tank 241-AW-105 during the PUREX facility decontamination was periodically transferred to other double-shell tanks for processing through the 242-A Evaporator. In November 1994, ~765,000 gallons of supernatant were transferred from tank 241-AW-105 to tank 241-AP-108 7CF10-055-094). This supernatant was then transferred to tank 241-AP-101 in December 1994, then to tank 241-AP-107 in January 1995 and finally tank 241-AW-102 in late January 1995. The supernatant was processed for volume reduction along with other dilute, double-shell tank supernatants through the 242-A Evaporator as campaign 95-1 (WHC-SD-WM-PE-055). An additional batch of 330,000 gallons of supernatant were transferred from tank 241-AW-105 to tank 241-AP-104 in November 1995 and processed for volume reduction with other dilute, double-shell tank supernatants through the 242-A Evaporator as campaign 96-1 (WHC-SD-WM-PE-056).

2.2.10 Composition of Waste Stored in Tank 241-AW-105

The Hanford Site prepares a Best Basis Inventory (BBI) estimate of the composition of the wastes stored in all 177 Hanford Site underground storage tanks. The BBI effort involves developing and maintaining waste tank inventories comprising 25 chemical and 46 radionuclide components in the 177 Hanford Site underground storage tanks. Waste sample analyses, process knowledge, and waste templates are used to create the BBIs. These BBIs provide waste composition data necessary as part of the River Protection Project (RPP) process flowsheet modeling work, safety analyses, risk assessments, and system design for retrieval, treatment, and disposal operations. Development and maintenance of the BBI is an on-going effort, with the current BBIs available electronically through TWINS, http://twins.pnl.gov/data/datamenu.htm .

Table 7 provides the BBIs for the major fission products and transuranic elements contained in each of the waste phases in tank 241-AW-105 as of October 13, 2004, with the radionuclides decay corrected to January 1, 2004. The volume and density of each waste phase present in tank 241-AW-105 are provided in Table 8. The following information was used in preparing the BBI for tank 241-AW-105:

- Statistical means for 2004 supernatant grab samples from tank 241-AW-105.
- Statistical means for the sludge core segments from tank 241-AW-105 2001 core samples.
- Statistical means for the supernatant core segments and the sludge core segments from tank 241-AW-105 1997 core samples 195 and 196.
- Statistical means from the 1996 grab samples.
- BBI waste type templates for zirconium cladding coating waste (CWZr2) and Dilute, non-complexed PUREX waste from miscellaneous streams, 1983-88 (PL2) for the sludge solids and sludge liquids, and Hanford Defined Waste (HDW) model vector 241-AW-105 for the supernatant (RPP-8847).
- Zirconium process knowledge from PUREX process records (HNF-SD-WM-TI-740).
- Process knowledge of uranium and plutonium contained in waste received from PUREX during post-shutdown plant cleanout activities in 1995 (Place 1995).

Where possible, the 2001 core data were used to derive the best-basis inventory for the CWZr2 and PL2 sludge solids and sludge liquids. Second in data hierarchy was the 1997 core data for the CWZr2 and PL2 sludge solids. Although the 2001 core is from a single riser only, the 2001 core is preferred over the 1997 core; this hierarchy fills a BBI requirement for separate solids and interstitial liquid estimates. When no analytical data were available, the CWZr2 solid and liquid templates, and the PL2 solid and liquid templates values were used to represent the sludge solids and sludge liquids. Templates are based on sampling data from tanks that contain the same waste type as tank 241-AW-105, supplemented with revision 5 HDW model data (RPP-19822).

Zirconium assays from tanks 241-AW-105 and 241-AW-103 are highly variable, which may be caused by non-homogeneous waste or laboratory bias. Zirconium in the CWZr2 sludge solids is represented with a process knowledge vector rather than sample data because in this particular case the process history is considered the best source of information. Zirconium is a limiting component in HLW glass formulation and therefore is a key analyte. The zirconium process knowledge vector for tank 241-AW-105 is based on fuel fabrication and fuel processing records reported in RPP-8847.

The sample-based U and Pu inventories for the CWZr2 sludge solids are not consistent with the transfer history. The U and Pu inventories are best represented by process knowledge vector which combines sampling data and waste transfer data. During the final cleanout of the PUREX facility in 1995, accountability records indicate that tank 241-AW-105 received a series of transfers containing 8.216 metric tons of uranium and 6.969 kilograms of plutonium (Place 1995). This cleanout waste had been processed through solvent extraction and contained essentially no fission products. Cadmium nitrate was added at the PUREX facility for criticality control. The U, Cd, and Pu are expected to have precipitated, forming a thin deposit on top of the CWZR2 sludge. The difference between the process history and sample-based inventories suggests that the thin layer of solids from these clean-out transfers may not have been fully represented by the solids sample vectors. Therefore, a process knowledge vector was developed to account for the U and Pu content of the NCRW sludge solids.

The sum of the concentrations of TRU with half-life greater than 20-years contained in the NCRW sludge and liquid phases is ~855 ηCi per gram. The sum of the TRU concentrations contained in the PL2 sludge and liquid phases (i.e. miscellaneous PUREX Plant wastes) is ~2,075 ηCi per gram. The supernatant waste phase contains ~0.4 ηCi per gram of the TRU.

Table 7. Best Basis Inventory for Tank 241-AW-105 as of October 13, 2004

Analyte	Waste Phase	Waste Type	Inventory Ci	Basis	Concentration µCi/gm
137Cs	Sludge (Liquids)	CWZr2 (Liquid)	1.69E+04	TE	6.18E+01
137Cs	Sludge (Liquids)	PL2 (Liquid)	5.39E+00	TE	4.32E-01
137Cs	Sludge (Solids)	CWZr2 (Solid)	2.23E+04	S	2.54E+01
137Cs	Sludge (Solids)	PL2 (Solid)	5.10E+03	S	6.19E+01
137Cs	Supernatant	NA	5.92E+03	S	9.33E+00
137Cs	Total		5.03E+04	S/TE	
237Np	Sludge (Liquids)	CWZr2 (Liquid)	4.14E-03	TE	1.51E-05
237Np	Sludge (Liquids)	PL2 (Liquid)	1.75E-05	TE	1.40E-06
237Np	Sludge (Solids)	CWZr2 (Solid)	5.12E-03	TE	5.92E-06
237Np	Sludge (Solids)	PL2 (Solid)	2.88E-05	TE	3.69E-07
237Np	Supernatant	NA	5.71E-03	TE	9.36E-06
237Np	Total		1.50E-02	TE	
238Pu	Sludge (Liquids)	CWZr2 (Liquid)	3.46E-01	TE	1.26E-03
238Pu	Sludge (Liquids)	PL2 (Liquid)	3.47E-02	TE	2.78E-03
238Pu	Sludge (Solids)	CWZr2 (Solid)	5.98E+01	C	6.16E-02
238Pu	Sludge (Solids)	PL2 (Solid)	4.55E+00	C	5.52E-02
238Pu	Supernatant	NA	1.35E-02	C	2.12E-05
238Pu	Total		6.47E+01	C/TE	
239Pu	Sludge (Liquids)	CWZr2 (Liquid)	3.50E+00	TE	1.28E-02
239Pu	Sludge (Liquids)	PL2 (Liquid)	3.44E-01	TE	2.75E-02
239Pu	Sludge (Solids)	PL2 (Solid)	4.49E+01	C	5.46E-01
239Pu	Sludge (Solids)	CWZr2 (Solid)	6.03E+02	E	6.21E-01
239Pu	Supernatant	NA	1.36E-01	C	2.14E-04
239Pu	Total		6.52E+02	E/C/TE	
240Pu	Sludge (Liquids)	CWZr2 (Liquid)	9.84E-01	TE	3.59E-03
240Pu	Sludge (Liquids)	PL2 (Liquid)	9.68E-02	TE	7.75E-03
240Pu	Sludge (Solids)	CWZr2 (Solid)	1.70E+02	E	1.75E-01
240Pu	Sludge (Solids)	PL2 (Solid)	1.27E+01	C	1.54E-01
240Pu	Supernatant	NA	3.83E-02	C	6.04E-05
240Pu	Total		1.84E+02	E/C/TE	
241Am	Sludge (Liquids)	CWZr2 (Liquid)	4.84E+00	TE	1.77E-02
241Am	Sludge (Liquids)	PL2 (Liquid)	3.59E-02	TE	2.87E-03
241Am	Sludge (Solids)	CWZr2 (Solid)	2.37E+02	S	2.70E-01
241Am	Sludge (Solids)	PL2 (Solid)	1.45E+02	S	1.76E+00
241Am	Supernatant	NA	3.79E-02	S	5.97E-05
241Am	Total		3.86E+02	S/TE	
90Sr	Sludge (Liquids)	CWZr2 (Liquid)	1.11E+03	TE	4.06E+00
90Sr	Sludge (Liquids)	PL2 (Liquid)	4.72E+00	TE	3.78E-01
90Sr	Sludge (Solids)	CWZr2 (Solid)	7.52E+03	S	8.56E+00
90Sr	Sludge (Solids)	PL2 (Solid)	2.27E+04	S	2.75E+02
90Sr	Supernatant	NA	1.31E+01	S	2.07E-02
90Sr	Total		3.13E+04	S/TE	
99Tc	Sludge (Liquids)	CWZr2 (Liquid)	3.88E+00	TE	1.42E-02

Table 7. Best Basis Inventory for Tank 241-AW-105 as of October 13, 2004

Analyte	Waste Phase	Waste Type	Inventory Ci	Basis	Concentration µCi/gm
99Tc	Sludge (Liquids)	PL2 (Liquid)	1.24E-03	TE	9.92E-05
99Tc	Sludge (Solids)	CWZr2 (Solid)	4.81E+00	TE	5.57E-03
99Tc	Sludge (Solids)	PL2 (Solid)	2.04E-03	TE	2.62E-05
99Tc	Supernatant	NA	5.36E+00	TE	8.78E-03
99Tc	Total		1.41E+01	TE	

Notes: S - Sample-based
C - Calculated
E - Engineering assessment-based
TE - Based on an HDW model/engineering-based waste template
TS - Based on a sample-based waste template

Table 8. Volume and Density of 241-AW-105 Waste Phases

Waste Phase	Origin	Volume (kL)	Density (g/ml)
Supernatant		593	1.06
PL2 Sludge	Miscellaneous PUREX wastes. See Section 2.2.4	61	1.41
PL2 Sludge - Interstitial Liquid	Miscellaneous PUREX wastes. See Section 2.2.4	12	1.17
CWZr2 Sludge	NCRW sludge. See Section 2.2.6.	660	1.47
CWZr2 Sludge - Interstitial Liquid	NCRW sludge. See Section 2.2.6.	266	1.10

3.0 WASTE GENERATED AT CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, plutonium processing, and waste management activities conducted in the processing plants are discussed further in DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997* and DOE/RL-97-1047, *Hanford Site Historic District History of the Plutonium Production Facilities 1943 – 1990.*

It has been established in Section 2.0 that neutralized DSSF from the 242-A Evaporator, 100-N Reactor decontamination waste, cladding removal waste (NCRW), and miscellaneous wastes from the 202-A PUREX Plant were transferred into tank 241-AW-103. The following sections provide a discussion of the processed that generated these waste types.

3.1 PUREX PLANT

The PUREX Plant processed irradiated nuclear fuels using a continuous solvent extraction process to separate uranium and plutonium from waste products. The 202-A PUREX Plant was constructed from April 1953 through April 1955. Following non-radioactive commissioning tests in 1955, the PUREX plant was operated from January 1956 through September 1972 and then from October 1983 to December 1988 to reprocess irradiated nuclear fuels (PPD-493-9-DEL and WHC-MR-0437). A brief, stabilization run was conducted in 1990 and then the facility was shutdown (letter 9305270), followed by facility decontamination from 1993 through 1996.

3.1.1 Coating Dissolution

The first step in the processing of irradiated nuclear fuels is to dissolve the coating or cladding that encases the fuel. The PUREX Plant processed both aluminum coated and zirconium clad irradiated nuclear fuels. For the aluminum coated fuel, the fuel coating was dissolved in sodium hydroxide – sodium nitrate solution. The coating removal waste (designated as CW) was inherently alkaline and did not require neutralization before transfer to underground storage tanks. Tank 241-AW-103 did not receive any coating removal waste from dissolution of aluminum clad fuel.

The zirconium clad fuel, Zircaloy® (98.5% zirconium and 1.5% tin), was dissolved in a solution of ammonium fluoride and ammonium nitrate. The ammonium fluoride / ammonium nitrate solution also attacked the uranium fuel, and a small amount of the uranium, transuranic elements, and other fission products were also dissolved in the process. Most of the uranium and transuranic elements that were dissolved during the coating dissolution were present as fluoride solids.

The cladding dissolution solution and entrained solids were removed from the dissolver by jetting to PUREX tank E-3. The uranium fuel in the dissolver was rinsed with water and the rinse water combined with the cladding waste. The cladding waste was then processed through the E Cell centrifuge, where the solution is separated from the uranium and transuranic fluoride solids and transferred to PUREX tank E-5. The uranium and transuranic fluoride solids remained in the centrifuge bowl and were metathesized to hydroxide precipitates by addition potassium hydroxide. The metathesis solution was separated from the uranium and plutonium hydroxide precipitates by centrifugation and washing. The metathesis and wash solutions were also collected in PUREX tank E-5. The cladding and metathesis wastes, plus wash solutions that were collected in PUREX Plant tank E-5 were neutralized with sodium hydroxide, and the slurry was transferred to the tank farms to allow solids in the waste to precipitate as sludge. The zirconium cladding waste was designated as NCRW (PFD-T-200-00002).

3.1.2 Solvent Extraction

After dissolving the coating / cladding on the irradiated nuclear fuel, the uranium fuel elements were then dissolved. The dissolved fuel elements are then processed through a solvent extraction system that used tri-butyl phosphate solvent in a normal paraffin hydrocarbon diluent. The fission products and impurities were separated in a nitric acid solution from the uranium and plutonium in the PUREX solvent extraction process. The nitric acid solution containing the fission products and impurities was evaporated to volatilize nitric acid for recovery and re-use in the PUREX Plant (RHO-MA-116, page 4-162).

The concentrated, acidic fission product solution was partially denitrated by sugar addition and neutralized by the addition of sodium hydroxide solution in PUREX tank F-16. The neutralized waste was transferred from PUREX tank F-16 to underground storage tanks in the 200 East Area tank farms. The waste formed supernatant and sludge layers within the tanks. Most of the supernatant, known as PUREX supernatant neutralized (PSN) was eventually processed in the 221-B Plant to remove cesium. Most of the PUREX waste sludges were sluiced from single-shell tanks, acidified (waste known as PUREX Acidified Sludge [PAS]), and transferred to 221-B Plant to remove strontium.

The plutonium solutions generated at the PUREX Plant were transferred to the 234-5Z building (Z-Plant) for further processing. Uranium solutions were transferred to the 224-U building (UO_3 Plant) for conversion to an oxide and transfer to offsite facilities for re-use in the fabrication of nuclear fuel.

3.1.3 Miscellaneous Plant Waste Solutions

During the solvent extraction process conducted at the PUREX Plant, the organic solvents were washed to remove organic degradation products that would interfere with the process. The waste from washing the organic solvents, known as organic wash waste (OWW), was collected in PUREX Plant tanks G-8 and R-8 before transfer to the underground storage tanks.

Miscellaneous low, radioactivity wastes from the 291-A exhaust ventilation were also collected in PUREX Plant tank U-3 (RHO-MA-116, page 4-167). Tanks U-3 and U-4 also collected miscellaneous laboratory sump wastes and sump waste from the 206-A acid fractionator building (RHO-MA-116, page 4-167). Miscellaneous low, radioactivity wastes from the cell sumps were collected in PUREX Plant tank F-18. Sodium nitrite and sodium hydroxide were added to the miscellaneous low, radioactivity waste streams collected in tanks U-3, U-4, and F-18 to meet corrosion inhibitor requirements and then transferred to the underground storage tanks.

3.2 242-A EVAPORATOR

The 242-A Evaporator was constructed in the 200 East Area of the Hanford Site from 1974 through 1977. Figure 4 depicts the 242-A Evaporator building. The 242-A Evaporator is the second vacuum evaporation unit constructed at the Hanford Site and is similar in design to the 242-S Evaporator. The 242-A Evaporator began operation in 1977 and processed intermittent batches of wastes through 1989. The evaporator was shutdown from late 1989 through early 1994 for upgrades.

The 242-A Evaporator process employs a conventional forced-circulation, vacuum evaporation system to concentrate radioactive waste solutions. The main process components of the evaporator-crystallizer system are the re-boiler, vapor-liquid separator, recirculation pump, condensers, vacuum system, condensate collection tank, and ion exchange column (no longer in service).

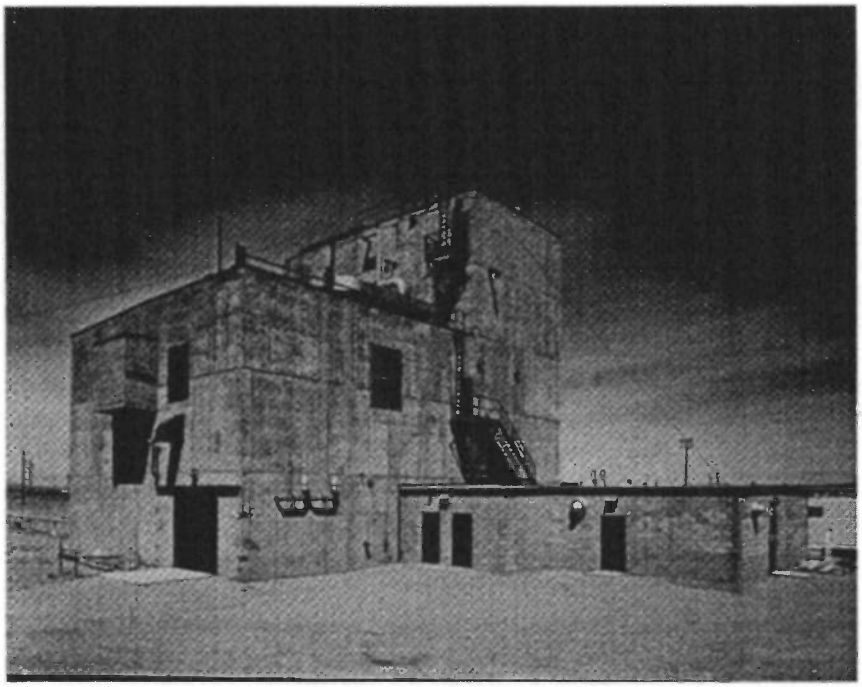
Waste from tank 241-AW-102[15] is pumped into the evaporator recirculation line on the upstream side of the re-boiler at a rate to maintain a constant specific gravity in the concentrated waste. As the feed enters the recirculation line, it blends with the main process slurry stream which flows to the re-boiler. In the re-boiler, the mixture is heated slightly to a temperature normally between 130°F and 170°F by steam that is flowing through the re-boiler shell. The steam and waste do not come into direct contact. The heated slurry is discharged from the re-boiler to the vapor-liquid separator. A fraction of the water in the waste flashes to steam in the vapor-liquid separator and is drawn through the wire mesh de-entrainer pads into the vapor line leading to the condensers. The steam derived from the waste is condensed to water and discharged to the 200 East Area Effluent Treatment Facility. As evaporation takes place in the vapor-liquid separator vessel, the waste is concentrated. Waste flows from the vapor-liquid separator vessel to

[15] Tank 241-A-102 was used as the evaporator feed tank from 1977 through 1980.

the recirculation pump suction via a drop-out leg. The recirculation pump discharges the slurry back to the re-boiler.

The process continues until the waste reaches the desired concentration point. At which point, a small fraction of the concentrated waste is withdrawn from the upper recirculation line and is pumped by the slurry pump to an underground storage tank. Prior operation of the 242-A Evaporator (1977 – 1985) was conducted to achieve super-saturation of the waste in the vapor-liquid separator vessel, which creates new salt crystal nuclei and promotes growth of existing crystals in the slurry liquor. Typically, waste was concentrated to the saturation limit for sodium aluminate and the resulting slurry discharged from the evaporator was designated as DSSF. Waste concentrated beyond the saturation limit for sodium aluminate is designated as double-shell slurry (DSS) with only one tank full of this waste type having been made to date, which is presently stored in tank 241-AN-103. Production of DSSF and DSS were conducted to minimize the volume of wastes stored in the double-shell tanks. However, this practice was not continued when the evaporator re-started operations in 1994 because of concerns with retention of gases in the DSSF and DSS wastes.

Figure 4 242-A Evaporator

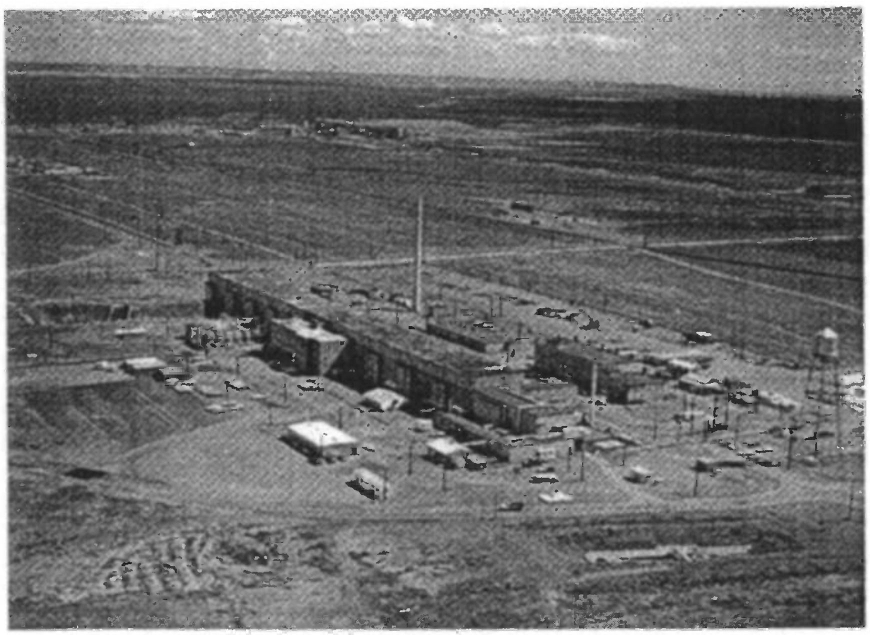


3.3 221-B PLANT FISSION PRODUCTS PROCESSING

The 221-B Plant was originally constructed from 1943-1945 as part of the Manhattan Project during WWII. The plant operated from April 1945 through September 1952 processing irradiated uranium fuel elements to separate plutonium. The process equipment in B Plant was flushed to remove residual plutonium and fission products and placed in standby status until 1961. From 1961 through July 1963, equipment was replaced in some of the process cells within B Plant to prepare the facility for recovery of fission products from high-level waste solutions. Figure 5 provides an aerial view of the B Plant.

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. The cesium ion exchange process was operated from December 1967 through September 1983 and again briefing in October 1985 through February 1986. The strontium solvent extraction process operated from January 1968 through mid-1977. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

Figure 5 221-B Plant and WESF circa 1978



3.3.1 STRONTIUM AND RARE EARTHS PROCESSING

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, page B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144 and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, and cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-

SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.3.2 CESIUM AND STRONTIUM PROCESSING

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). The recovered cesium was purified through a second ion exchange process that used an inorganic ion exchange media (SD-RE-TM-002). The second ion exchange process was conducted from August 1974 through September 1983. The waste from the second ion exchange process was blended with the feed solutions to the first ion exchange process. The purified cesium solution was transferred to the 225-B Waste Encapsulation and Storage Facility (WESF) for conversion to cesium chloride salt and double contained sealing in stainless steel capsules (SD-RE-TM-002). A brief cesium ion exchange campaign was conducted from October 1985 through February 1986 to process cesium chloride solution recovered from cesium capsules. Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917). The PTA process operated from 1968 through 1972.

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PRD-SEP-68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges that had been acidified (known as PAS) in 244-AR Vault and transferred to B-Plant for centrifugation to separate solids and strontium removal (PRD-SEP-68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until mid-1977.

3.4 HOT SEMIWORKS

The Hot Semiworks, 201-C building, was constructed in 1951 to 1952 as a research and test facility for the REDOX and TBP Plant chemical separations processes (HW-22955). An aerial view of the Hot Semiworks facility circa 1983 is provided in Figure 6. The Hot Semiworks was originally operated from November 1952 to October 1953 as a pilot facility to research and demonstrate the REDOX chemical separations process (HW-31767). The facility was modified in 1953 and operated from May 1955 (HW-38768-RD) through March 1956 (HW-49673-RD) as a research and demonstration facility for the PUREX chemical separations process. REDOX and PUREX process flowsheet testing conducted at the Hot Semiworks included the dissolution of aluminum clad irradiated fuel for processing through the pilot plant solvent extraction system to separate uranium and plutonium from fission products.

Following completion of the PUREX chemical separation process research and development activities, a maintenance program was initiated at the Hot Semiworks facility for plant improvements. This maintenance program was completed in July 1957 and the Hot Semiworks was placed in standby mode in July 1957 (HW-52860). The Hot Semiworks was re-activated in 1961 and used until 1967 to separate fission products from various high-level waste solutions. The above ground structures at the Hot Semiworks were demolished in 1983-84 (WHC-SD-EN-ES-019).

The radioactive waste from the REDOX process research test runs were concentrated and transferred to an underground storage tank, TK-70 (also designated as 241-CX-70) located at the Hot Semiworks 241-CX tank farm facilities. The organic solvent waste from the REDOX process test runs was transferred to an underground crib. The radioactive wastes from the PUREX process research test runs were concentrated and transferred to tanks 241-C-201 through 241-C-204 (RPP-15408). Process condensates and cooling water from equipment in the Hot Semiworks were transferred to crib 216-C-1 (HW-48518, page 21). Process condensates from the evaporation of radioactive waste were transferred to crib 216-C-6 (HW-48518, page 21). Organic solvent waste from the PUREX process research runs was transferred from Hot Semiworks building 276-C to crib 216-C-4 starting in October 1955 (HW-48518, page 22).

In 1961, the Hot Semiworks was modified to incorporate solvent extraction and ion exchange columns for demonstrating strontium purification processing (HW-68786). The Hot Semiworks was operated from May 1961 to October 1961 to demonstrate strontium separation from PUREX waste and transfer the separated strontium to Oak Ridge National Laboratory (HW-72666-RD Part 1, page 6). The Hot Semiworks facility was renamed the Strontium Semiworks facility in 1961 and was operated until 1967 to separate strontium from various waste solutions.

The Strontium Semiworks along with a renovated portion of B-Plant, PUREX Plant head-end, and the 244-CR vault were used from 1961 through 1967 to separate strontium-90, cesium-137, cerium-144, and promethium-147 from various waste solutions (HW-71179). The head-end of PUREX was used to separate strontium-90 from high-level waste with the strontium-90 solution transferred to the 244-CR vault for storage and decay of strontium-89 and eventual transfer to the Strontium Semiworks. The 244-CR vault was also used to transfer solutions containing strontium and rare earths from the PUREX Plant to B-Plant for separating the strontium-90 and rare earths (mixture of cerium-144 and promethium-147) into separate solutions (HW-77016).

The strontium-90 solution and rare earths solution were transferred separately to the Strontium Semiworks for further purification and load-out onto casks (HW-78987-REV, page 12 and HW-81481, page 38). Solvent extraction equipment was operated under various flowsheet conditions to purify separate batches of strontium-90, cerium-144, and promethium-147. Organic solvent waste from the Strontium Semiworks was transferred to an underground crib. When the Strontium Semiworks was eventually shutdown in 1967, the organic solvent was transferred to the REDOX Plant for incorporation in the REDOX process.

PUREX high-level waste solutions that were stored in C Farm were also passed through a shielded cask that contained Decalso®[16] ion exchange material to separate cesium-137. Building 801-C in C-Farm was used to contain the shielded cask while cesium was loaded onto the ion exchange material (HW-71333). A cask station at the PUREX facility was also used to load cesium onto ion exchange material.

The Strontium Semiworks was also used in conjunction with the 801-C cask station to demonstrate the separation of technetium-99 from alkaline high-level waste solutions. Approximately 1-kg of technetium-99 was separated from high-level waste that was stored in C-Farm SSTs in October 1963 (HW-79377-C, page C-7 and HW-79480, page

[16] Decalso® is a synthetic, sodium aluminosilicate gel manufactured by the Permutit Company, New York.

G-2). The high-level waste solution was passed through a shielded cask in the 801-C building that contained Decalso® ion exchange material to separate cesium. The effluent solution from the cesium cask was then passed through a separate shielded cask in the 801-C building that contained IRA-401®[17] ion exchange material, which adsorbed technetium from the waste solution. The Strontium Semiworks received the cask that was loaded with technetium in November 1963, eluted and concentrated the technetium, which was then loaded into a smaller cask for transfer to the Hanford Laboratories located in the 300 Area (HW-79768, page G-2). A second campaign to recover an additional 1-kg of technetium-99 from high-level waste stored in C-Farm was conducted in August through September 1964 in the same manner as the first campaign (HW-83876, page B-2 and HW-84354, page B-1).

In addition to the technetium-99 campaigns, the Strontium Semiworks used the installed solvent extraction equipment to purify a solution containing a mixture of americium, cerium, and rare earths (HAN-98529-DEL, page AIII-3). The solution containing a mixture of americium, cerium, and rare earths had been separated at the REDOX facility while reprocessing the irradiated fuel from the Shippingport reactor (ARH-1354). The americium, cerium, and rare earths were shipped the Hanford Laboratories in the 300 Area.

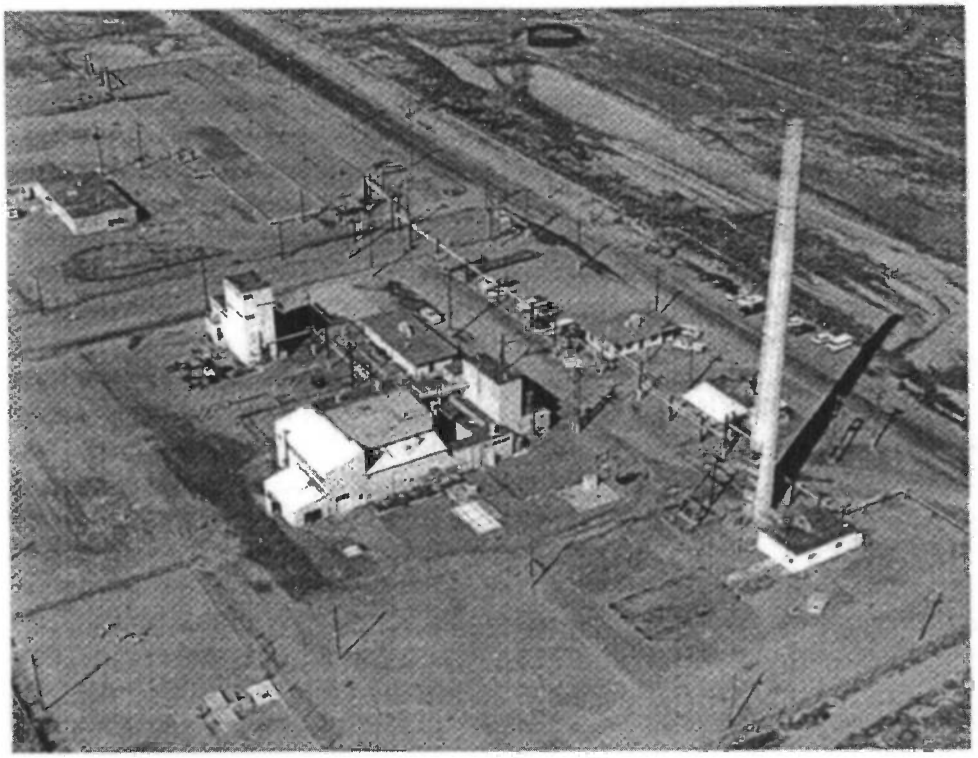
Tanks 241-C-107, 241-C-108, 241-C-109, 241-C-111, and 241-C-112 all received highly radioactive waste solutions from the Strontium Semiworks from 1961 through 1967 (RPP-15408, page 15). Tank 241-CX-70 did not receive any waste from the Strontium Semiworks operations.

After being used successfully to separate various fission products from waste solutions, the Strontium Semiworks was deactivated beginning from October 1967 (HAN-98918-DEL, page AIII-3) through November 1967 (HAN-99196-DEL, page AIII-3).

---

[17] IRA-401® is a styrene, di-butyl benzene ion exchange bead manufactured by the Rohm and Haas Company, Philadelphia, Pennsylvania.

Figure 6 Hot Semiworks circa 1983



3.5 100-N REACTOR DECONTAMINATION WASTE

This section provides only a general description of the 100-N Reactor. For further details in the 100-N Reactor, see DOE/RL-97-1047.

The 100-N Reactor is one of the nine graphite core reactor that were constructed at the Hanford Site from 1943 through 1963. The 100-N Reactor was completed in 1963 and operated until 1986. Purified water was re-circulated through the reactor core in a closed-loop cooling system. The 100-N Reactor also generated steam which was transferred to a commercial facility for the production of electricity.

Periodic maintenance was conducted on the radioactively contaminated components of the reactor. The radioactively contaminated components of the reactor were first decontaminated prior to maintenance activities. The 100-N Reactor decontamination wastes have been described as a 4 percent tri-sodium phosphate (Na_3PO_4) and 2 percent sodium sulfate (Na_2SO_4) solution (letter 65413-79-174). However, other decontamination chemicals are likely to have been used. Analyses of the 100-N Reactor decontamination solutions were not located.

The spent decontamination solutions were transported from the 100-N Reactor area via railcar to the 200 Area tank farms for storage in the underground tanks. Prior to 1980, the 100-N Reactor decontamination wastes were unloaded to tanks at the 204-S facility (see Figure 7) located in the 200 West Area and then transferred to single-shell tanks. Beginning in 1980, the 100-N Reactor decontamination wastes were received in the 204-AR Railcar Unloading facility (see Figure 8) located in the 200-E Area of the Hanford Site and then transferred to various double-shell tanks.

Figure 7. 204-S Tanker Car Unloading Facility

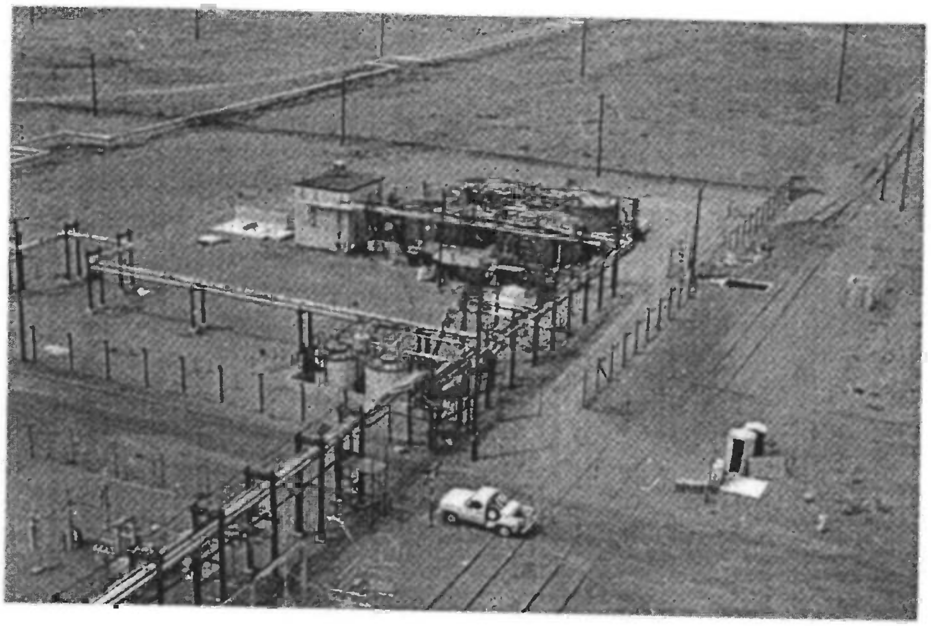
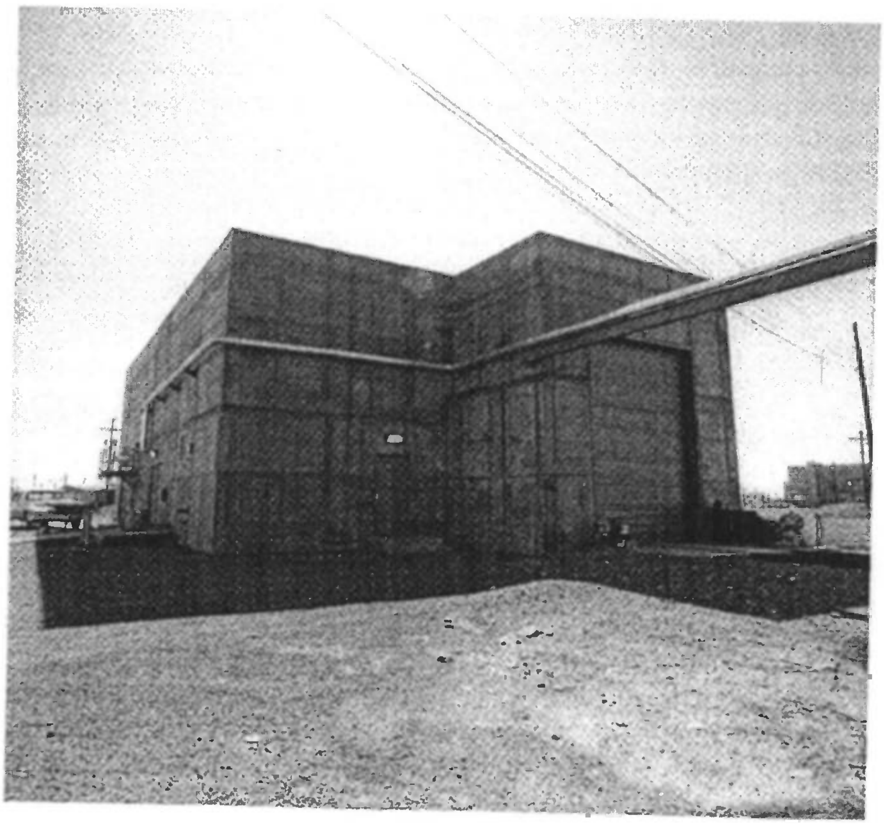


Figure 8. 204-AR Railcar Unloading Facility



4.0 SUMMARY

Tank 241-AW-105 received CC waste in 1980 and miscellaneous B Plant low activity wastes in 1982. These wastes were transferred in April 1983 to tank 241-AW-101, leaving a heel of ~51,000 gallons in tank 241-AW-105. Tank 241-AW-105 was next used to store DSSF and N reactor decontamination wastes from tank 241-AW-103 and miscellaneous low activity wastes from the PUREX Plant from April 1983 – July 1984. While the majority of these wastes were removed in 1984, the miscellaneous PUREX Plant waste had precipitated leaving a heel of approximately 73,000 liters (~19,300 gallons or ~7 inches of waste) of sludge categorized as PL2 type waste in tank 241-AW-105. The PL2 sludge waste phase contains ~2,075 ηCi/gram TRU, as well ~5,110 Ci of ^{137}Cs and 22,700 Ci ^{90}Sr.

Tank 241-AW-105 was then used from 1984 through 1988 to receive neutralized cladding removal waste (NCRW) from the PUREX Plant and high TRU content sludge retrieved from tank CX-70. The tank CX-70 waste was generated during REDOX process research and testing studies conducted at the 201-C Hot Semiworks. Tank 241-AW105 also received miscellaneous low activity wastes from stabilization and decommissioning the PUREX Plant conducted from 1992 through 1996. The NCRW formed a sludge fraction that deposited atop the PL2 sludge in tank 241-AW-105. The supernatant was periodically transferred from tank 241-AW-105 to other double-shell tanks for dispositioning. Tank 241-AW-105 presently contains ~593,000 liters (157,000 gallons) of supernatant. The supernatant contains 0.4 ηCi/gram TRU, as well as 5,920 Ci of ^{137}Cs and 13.1 Ci of ^{90}Sr. Approximately 926,000 liters (~272,900 gallons) of NCRW sludge are present in tank 241-AW-105. The NCRW sludge phase contains approximately 855 ηCi per gram TRU, as well as 39,200 Ci of ^{137}Cs and 8,630 Ci of ^{90}Sr.

5.0 REFERENCES

13331-87-975, 1987, "242-A Evaporator Run Schedule for Run 88-1", (letter from B. H. Von Bargen to G. L. Dunford, December 28), Westinghouse Hanford Company, Richland, Washington (RMIS TFIC Accession #D194025835)

65413-79-174, 1979, "Chemical Research on Customer Wastes Containing Phosphates," (letter from H. J. Eding to F. M. Jungfleisch, October 29), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195015061)

65453-82-345, 1982, "Complexed Liquor Analysis & Thermal Degradation of Complexants," (letter from M. T. Jansky to J. R. Wetch dated September 20, 1982), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195015061)

65453-85-235, 1985, "Analysis of Tank CX-70 Waste", (internal letter from M. T. Jansky to G. E. Entrop, December 10), TCSRC, Rockwell Hanford Operations, Richland, Washington.

65453-85-246, 1985, "Analysis of Tank CX-70 Waste", (internal letter from M. T. Jansky to Those Listed, December 31), TCSRC, Rockwell Hanford Operations, Richland, Washington.

65611-86-118, 1986, "Sludge Height in Tanks 103-AW and 105-AW," (internal letter from J. A. Unruh to D. E. McKenney, July 7), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession #D193015184)

65611-87-090, 1987, "Tanks 241-AW-103 and 241-AW-105 Sludge Heights and Sludge Generation Rates," (internal letter from A. C. Coroneos to D. E. McKenney, May 18), Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession #D193015187)

65950-83-998PM, 1983, "Process Memo Transfer from AW103 to AW105," (letter from N. L. Pontious to Distribution, no date), Rockwell Hanford Operations, Richland, Washington. (RMIS-TFIC Accession #D196216796)

65950-83-1004, 1983, "Resolution of the Material Balance Discrepancy of Tank 105-AW to Tank 101-AW Transfer," (letter from J. F. Albaugh to G. T. Dukelow dated April 25, 1983), Rockwell Hanford Operations, Richland, Washington. (RMIS-TFIC Accession #D194033928)

7CF10-055-094, 1994, "242-A Evaporator Campaign 95-1 Waste Compatibility Assessment of Tank 241-AW-105 Waste with Tank 241-AP-108 Waste," (internal memorandum from J. M. Jones to R. A. Dodd, November 15, 1994, Westinghouse Hanford Company, Richland, Washington. (RMIS-TFIC Accession #D196149995)

9305270, 1992, "Termination of the Plutonium-Uranium Extraction (PUREX) Plant and Guidance to Proceed with Shutdown Planning and Terminal Cleanout Activities," (letter from W. W. Bixby, U. S. Department of Energy Deputy Assistant Secretary for Facility Transition and Management to J. D. Wagoner, Manager DOE Richland Field Office, December 21), U.S. Department of Energy, Washington, D.C.

ARH-1354, 1969, *Recovery of Am, Cm, and Pm from Shippingport Reactor Fuel Reprocessing Waste by Successive TBP and D2EHPA Extractions*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-917, 1977, *Evaluation of Phosphotungstic Acid Process for Removal of Cesium-137 from PUREX Current Acid Waste*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-LD-215B, 1976, *Atlantic Richfield Hanford Company Monthly Report March 1976*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-LD-217B, 1976, *Atlantic Richfield Hanford Company Monthly Report May 1976*, Atlantic Richfield Hanford Company, Richland Washington.

Daily Operating Report Tank Farm Processing Operations January – December 1985, TCSRC, Rockwell Hanford Operations, Richland, Washington.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at http://www.hanford.gov/doe/culres/mpd/toc.htm, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-97-1047, 2002, *Hanford Site Historic District History of the Plutonium Production Facilities 1943 – 1990*, Battelle Press, Columbus, Ohio.

E-mail, 1995, *Tank 105-AW Additions*, dated April 19, 1995 from D. E. Place to L. M. Sasaki, Westinghouse Hanford Company, Richland, Washington.

E-mail, 1996, *Np Transfer to AZ-102*, dated August 28, 1996 from M. B. Enghusen to D. E. Place, Westinghouse Hanford Company, Richland, Washington.

HAN-90907, 1965, *Monthly Status and Progress Report for February 1965*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95105-DEL, 1966, *Monthly Status and Progress Report for June 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95284-DEL, 1966, *Monthly Status and Progress Report for July 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96590-DEL, 1967, *Monthly Status and Progress Report for Januar1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96805-DEL, 1967, *Monthly Status and Progress Report for February 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-97066-DEL, 1967, *Monthly Status and Progress Report for March 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-98529-DEL, 1967, *Monthly Status and Progress Report August 1967*, U.S. Atomic Energy Commission, Richland Operations Office, Richland, Washington.

HAN-98918-DEL, 1967, *Monthly Status and Progress Report October 1967*, U.S. Atomic Energy Commission, Richland Operations Office, Richland, Washington.

HAN-99196-DEL, 1967, *Monthly Status and Progress Report November 1967*, U.S. Atomic Energy Commission, Richland Operations Office, Richland, Washington.

HAN-99396-DEL, 1967, *Monthly Status and Progress Report for December 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-99604-DEL, 1968, *Monthly Status and Progress Report for January 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100127-DEL, 1968, *Monthly Status and Progress Report for March 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-100357-DEL, 1968, *Monthly Status and Progress Report for April 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HNF-SD-WM-TI-740, 1999, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Waste*, Rev. 0C, Lockheed Martin Hanford Corporation, Richland, Washington.

HNF-SP-1147, 1997, revision 2, *PUREX / UO3 Facilities Deactivation Lessons Learned History*, Fluor Daniel Hanford Company, Richland, Washington.

HW-22955, 1951, *Hot Semiworks Manual*, General Electric Company, Richland, Washington.

HW-31767, 1954, *Hot Semi-Works REDOX Studies*, General Electric Company, Richland, Washington.

HW-38768-RD, 1955, *Hot Semi-Works Summary Run PX-1, August 23, 1955*, General Electric Company, Richland, Washington.

HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities through December 1956*, General Electric Company, Richland, Washington.

HW-49673-RD, 1957, *Hot Semi-Works Summary Run PX-18, March 20, 1957*, General Electric Company, Richland, Washington.

HW-52860, 1957, *Standby Status Report for the Hot Semi-Works Facility*, General Electric Company, Richland, Washington.

HW-63051, 1961, *The Recovery of Fission Product Rare Earth Sulfates from PUREX IWW*, General Electric Company, Richland, Washington.

HW-68786, 1961, *Incorporation of Ion Exchange in the Hot Semi-Works Solvent Extraction Strontium Facility*, General Electric Company, Richland, Washington.

HW-69011, 1961, *Project CGC-897 – Title I Design Fission Product Storage in B Plant*, General Electric Company, Richland, Washington.

HW-69534, 1961 *Laboratory Development of a Carrier Precipitation Process for the Recovery of Strontium from PUREX Wastes*, General Electric Company, Richland, Washington.

HW-71179, 1961, *Hanford Fission Product Contemplated Facility Plan*, General Electric Company, Richland, Washington.

HW-71187-DEL, 1961, *Chemical Processing Department Monthly Report for September 1961*, General Electric Company, Richland, Washington.

HW-71333, 1961, *Process Engineering Cesium Load-out Facility at the 241-C Tank*

Farm, General Electric Company, Richland, Washington.

HW-72666-RD, Part 1, 1962, *Hot Semi-Works Strontium-90 Recovery Program: Part 1: Program Synopsis*, General Electric Company, Richland, Washington.

HW-76848-DEL, 1963, *Chemical Processing Department Monthly Report for February 1963*, General Electric Company, Richland, Washington.

HW-77016, 1963, *B-Plant Phase I Information Manual*, General Electric Hanford Atomic Products Operation, Richland, Washington.

HW-78817-DEL, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Richland, Washington.

HW-78987-REV, 1963, *Separation of Trivalent Rare Earths from Cerium*, General Electric Company, Richland, Washington.

HW-79377-C, 1963, *Chemical Laboratory Monthly Report October 1963*, General Electric Company, Richland, Washington.

HW-79480, 1963, *Chemical Processing Department Monthly Report for October 1963*, General Electric Company, Richland, Washington.

HW-79768, 1963, *Chemical Processing Department Monthly Report for November 1963*, General Electric Company, Richland, Washington.

HW-81373, 1964, *Removal of Lead from B-Plant Cerium and Rare Earth Fractions*, General Electric Company, Richland, Washington.

HW-81481, 1964, *Waste Management Program Chemical Processing Department*, General Electric Company, Hanford Atomic Products Operation, Richland, Washington.

HW-83876, 1964, *Chemical Processing Department Monthly Report for August 1964*, General Electric Company, Richland, Washington.

HW-84354, 1964, *Chemical Processing Department Monthly Report for September 1964*, General Electric Company, Richland, Washington.

MEM-041576, 1976, "Analysis of Tank CX70," (letter from J. E. Horton to R. L. Walser, April 15), Atlantic Richfield Hanford Company, Richland, Washington. (RMIS TFIC Accession # D194039440)

Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72, letter dated July 2, 1974 from J. A. Teal to D. G. Harlow, TCSRC, Atlantic Richfield Hanford Company

PFD-T-200-00002, 1983, 1983, *Zirflex Decladding Sludge Flowsheet – Reverse Strike*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession #D197178128)

Place, D. E., 1995, "Tank 105-AW Additions," (e-mail to L. M. Sasaki, April 19), Westinghouse Hanford Company, Richland, Washington.

PPD-493-9-DEL, 1972, *RL Monthly Status and Production Report – September 1972*, U.S. Atomic Energy Commission, Richland Operations Office, Richland, Washington.

PRD-SEP-68-DEL, 1968, *Monthly Status and Progress Report September 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

RHO, 1982, *Generated Waste & Evaporators from 1/01/1981 thru 11/01/1982*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193700)

RHO-CD-505 RD, 1978, *Synopsis of REDOX Plant Operations*, Rockwell Hanford Operations, Richland, Washington.

RHO-MA-116, 1982, *PUREX Technical Manual*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SA-169, 1986, *Sixteen Years of Cesium Recovery Processing at Hanford's B Plant*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SR-14-March 1983, 1983, *Waste Status Summary March 1983*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SR-14-April 1983, 1983, *Waste Status Summary April 1983*, Rockwell Hanford Operations, Richland, Washington.

RHO-RE-SR-14-June 1984, 1984, *Waste Status Summary June 1984*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-RE-OTR-009, 1983, *Operability Test Results (OTR) for Project B-281 Equipment, PUREX to 241-AW Tank Farm Process Lines and Jumpers*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-007897)

RHO-SD-RE-PCP-006, 1983, *Tank Farms Process Control Plan -PUREX Waste*, Rev. B-0, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-010990)

RHO-SD-WM-PE-004, 1982, *242-A Evaporator Campaign 80-8 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-005, 1982, Dilute Complexed Waste Concentration, 242-A Evaporator-Crystallizer Campaign 80-9, August 13 to August 30, 1980, Rockwell Hanford Operations, Richland Washington.

RHO-SD-WM-PE-006, 1982, *242-A Evaporator Campaign 80-10 Post Run Letter*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-007, 1982, *242-A Evaporator Campaign 81-1 Post Run Letter*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-017, 1984, *242-A Evaporator / Crystallizer FY 1984 Campaign Run 84-4 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

RHO-SD-WM-PE-026, 1986, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-1 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-031, 1986, *242-A Evaporator / Crystallizer FY 1986 Campaign Run 86-4 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RL-SEP-197, 1965, *Chemical Processing Department Monthly Report December 1964*, General Electric Company, Richland, Washington.

RPP-8847, 2004, *Best-Basis Inventory Template Compositions of Common Tank Waste Layers*, Rev. 1, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-15408, 2003, *Origin of Wastes in C-200 Series Single-Shell Tanks*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-19822, 2004, *Hanford Defined Waste Model -Revision 5*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

SD-RE-TM-002, 1988, *Technical Manual – Waste Encapsulation and Storage Facility*, Westinghouse Hanford Company, Richland, Washington.

SD-WM-TI-302, 1987, *Hanford Waste Tank Sluicing History*, Westinghouse Hanford Company, Richland, Washington.

WHC-EP-0182-9, 1988, *Tank Farm Surveillance and Waste Summary Report for December 1988*, Westinghouse Hanford Company, Richland, Washington.

WHC-MR-0437, 1993, *A Brief History of the PUREX and UO_3 Facilities*, Westinghouse Hanford Company, Richland, Washington. (RMIS Accession #D197257448)

WHC-SD-DD-TI-034, 1989, *Tank 241-CX-70 Waste Removal Assessment*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-DD-TI-057, 1991, *Summary of Radioactive Underground Tanks Managed by Hanford Restoration Operations*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-ES-019, 1992, *Semi-Works Aggregated Area Management Study Technical Baseline Report*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-ES-040, 1994, *Engineering Study of 50 Miscellaneous Underground Inactive Radioactive Waste Tanks Located at the Hanford Site, Washington*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-033, 1987, *242-A Evaporator / Crystallizer FY 1987 Campaign Run 87-3 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-055, 1996, *242-A Campaign 95-1 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-056, 1996, *242-A Campaign 96-1 Post Run Document*, Westinghouse Hanford Company, Richland, Washington.

WHC-SP-1011, 1994, *PUREX / UO_3 Deactivation Project Management Plan*, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

TANK 241-AW-105 WASTE TRANSFER RECORDS

A.1 WASTE TRANSFER RECORDS FOR JULY 1980 – SEPTEMBER 1985

Tank 241-AW-105 waste transfer records for July 1980 through September 1985 are listed in the daily operating reports for the Tank Farms as well as individual waste transfer datasheets. Appendix A-1 provides a summary of the tank 241-AW-105 waste transfers listed in Tank Farm daily operating reports and waste transfer datasheets.

A.2 WASTE TRANSFER RECORDS FOR JANUARY 1985 – AUGUST 2004

Tank 241-AW-105 waste transfers that occurred after January 1, 1985 are listed in the TWINS database at the following web addresses:

- January 1, 1985 to December 2000:

  http://twins.pnl.gov/data/hcde3s.exe?table=tcd.dbo.transfers_denorm&type=table&where1=waste_site_id+%3D+%27241-AW-105%27

- January 1, 2001 through the August 2004:

  http://twins.pnl.gov/data/hcde3s.exe?table=tcd.dbo.v_TXFR_transfers&type=table&where1=waste_site_id+%3D+%27241-AW-105%27

All waste transfers associated with tank 241-AW-105 from January 1985 through August 2004 were downloaded from the TWINS database on August 19, 2004 and listed in Appendix A-2.

Appendix A-1

Tank 241-AW-105 Waste Transfer Records

July 1980 through September 1985

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
1980	January		0		
	February		0		
	March		0		
	April		0		
	May		0		
	June		0		
	July		9,874	Approximately 9,875-gallons (3.75-inches) of water in tank from operability testing.	
	August	242-A Evaporator	919,180	Complexant Concentrate (CC) waste from evaporator campaign 80-9.	RHO-SD-WM-PE-005, 1982
	September		0		
	October		0		
	November		0		
	December		0		
1981	January		0		RMIS Document Accession # D196193700
	February		0		RMIS Document Accession # D196193700
	March		0		RMIS Document Accession # D196193700
	April		0		RMIS Document Accession # D196193700
	May		0		RMIS Document Accession # D196193700
	June		0		RMIS Document Accession # D196193700
	July		0		RMIS Document Accession # D196193700
	August		0		RMIS Document Accession # D196193700

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	September		0		RMIS Document Accession # D196193700
	October		0		RMIS Document Accession # D196193700
	November		0		RMIS Document Accession # D196193700
	December		0		RMIS Document Accession # D196193700
1982	January		0		RMIS Document Accession # D196193700
	February		0		RMIS Document Accession # D196193700
	March		0		RMIS Document Accession # D196193700
	April		0		RMIS Document Accession # D196193700
	May		0		RMIS Document Accession # D196193700
					RMIS Document Accession # D196193700
	June		0		RMIS Document Accession # D196193700
	July		0		RMIS Document Accession # D196193700
	August		0		RMIS Document Accession # D196193700
	September	241-AW-104	113,850	Transferred waste from tank 241-AW-104 into tank 241-AW-105 from 9/17/82 through 9/19/82	RMIS Document Accession # D196193700 and Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	October	none	0		RMIS Document Accession # D196193700 and Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	November	none	0		RMIS Document Accession # D196193700 and Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	December	none	0		Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
1983	January	none	0		Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	February	none	0		Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	March	none	0		Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	April		- 1,018,000	Transferred 1,018,000 gallons of waste from tank 241-AW-105 to tank 241-AW-101, leaving ~51,000 gallons of waste in tank 241-AW-105	Waste was processed in 242-A Evaporator as part of campaign 84-4 (RHO-SD-WM-PE-017)
	April	PUREX F-18, R-8, and G-8	10,175	RHO-SD-RE-OTR-009, (1983) Operability Test Results (OTR) for Project B-281 Equipment, PUREX to 241-AW Tank Farm Process Lines and Jumpers, identifies that ~10,450-gallons of waste was transferred into tank 241-AW-105 from PUREX tanks F-18, G-8, and R-8 (4/28 to 5/1/1983) as part of the testing of transfer routes.	Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	May	PUREX G-8, F-18, R-8, U-3	173,524	Tank 241-AW-105 reported to have received only 116,000-gallons of the 173,524-gallons of PUREX waste.	Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	June	PUREX G-8, F-18, R-8, U-3, U-4	205,708	RHO-MA-116 (1982), PUREX Technical Manual, page 4-152, Figure 4-16 identifies that tank TK-F18 received miscellaneous sump waste (e.g., cooling water and chemicals leaked into process cells) and sodium hydroxide solution (for neutralizing waste). Page 4-136, section 4.7.2.2 identifies that tanks TK-R-8 and G-8 received spent solvent wash solution.	Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	July	PUREX G-8, F-18, R-8, U-3	62,975		Daily Operating Report Tank Farm Processing Operations Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	August	PUREX G-8, F-18, U-3	106,150		Daily Operating Report Tank Farm Processing Operations and Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	September	PUREX G-8, F-18, R-8, U-3, U-4	195,159		Daily Operating Report Tank Farm Processing Operations and Monthly Waste Generations Actuals - FY 1983 (Tank Farm Information Center)
	September	241-AW-103	264,000	Transferred 100-inches (~264,000 gallons) of waste from tank 241-AW-103 to 241-AW-105.	65950-83-998PM
	October	PUREX G-8, F-18, R-8, U-3, U-4, 302-A catch tank	140,129		Daily Operating Report Tank Farm Processing Operations and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	November	PUREX G-8, F-18, R-8, U-3, U-4	163,202		Daily Operating Report Tank Farm Processing Operations and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	November		-314,929	Transferred 114.5-inches (399.6-inches to 285.1-inches) of waste (314,929-gallons) from tank 241-AW-105 to tank 241-AW-102 from 11/20/1983 to 11/26/1983.	Daily Operating Report Tank Farm Processing Operations and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center) Waste was processed in 242-A Evaporator as part of campaign 84-3 (RHO-SD-WM-PE-018)
	December	PUREX G-8, F-18, R-8, U-3, U-4	168,686		Daily Operating Report Tank Farm Processing Operations and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	December		-282,000	Transferred ~282,000 gallons from tank 241-AW-105 to tank 241-AZ-102 in December 1983.	
1984	January	PUREX G-8, F-18, R-8, U-3, U-4	187,549		Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	February	PUREX G-8, F-18, R-8, U-3	150,150		Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	March	PUREX G-8, F-18, R-8, U-3, U-4 241-AW-104	686,718	Received 215,368-gallons of PUREX wastes into tank 241-AW-105. Transferred 471,350-gallons of waste from tank 241-AW-104 into tank 241-AW-105.	Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	March		-192,775	Transferred 192,775-gallons of waste from tank 241-AW-105 into tank 241-AZ-102.	Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	April	PUREX G-8, F-18, R-8, U-3, U-4	166,643		RPT-040184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	April		-143,825	Transferred approximately 46-inches of waste (143,825-gallons) from tank 241-AW-105 to tank 241-AN-101 from 4-12-1984 to 4-14-1984.	RPT-040184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	May	PUREX G-8, F-18, R-8, U-3, U-4	157,094		RPT-050184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	May		-512,394	Transferred approximately 37.4-inches of waste (110,550-gallons) from tank 241-AW-105 to tank 241-AN-101 from 5-3-1984 to 5-5-1984. Transferred approximately 146.1-inches of waste (401,844-gallons) from tank 241-AW-105 to tank 241-AW-102 from 5-12-1984 to 5-15-1984.	RPT-050184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	June	PUREX G-8, F-18, R-8, U-3, U-4	166,383		RPT-060184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	June		-768,480	Transferred approximately 136.6-inches of waste (375,714-gallons) from tank 241-AW-105 to tank 241-AW-102 from 6-5-1984 to 6-7-1984. Transferred approximately 107.1-inches of waste (294,575-gallons) from tank 241-AW-105 to tank 241-AW-102 from 6-10-1984 to 6-13-1984. Transferred approximately 35.7-inches of waste (98,191-gallons) from tank 241-AW-105 to tank 241-AW-102 from 6-18-1984 to 6-20-1984.	RPT-060184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	July		-167,229	Transferred approximately 60.8-inches of waste (167,229-gallons) from tank 241-AW-105 to tank 241-AW-102 from 7-1-1984 to 7-4-1984. **Tank waste level at 37.1-inches (101,436-gallons) on 7-4-1984.**	RPT-070184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	July	PUREX E-5	198,550	Began routing E-5 waste (175,725-gallons) to tank 241-AW-105 on July 5, 1984. Routed U-3/U-4, R-8/G-8, and F-18 wastes to tank 241-AW-101.	RPT-070184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	August	PUREX E-5	196,350		RPT-080184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	September	PUREX E-5	118,222		RPT-090184 and Monthly Waste Generations Actuals - FY 1984 (Tank Farm Information Center)
	October	PUREX E-5	8,800		RPT-100184 and Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	November	PUREX E-5	55,825		RPT-110184 and Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	December	PUREX E-5	133,650		RPT-120184 and Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
1985	January	PUREX E-5	49,675		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	February	none	0		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	March	none	0		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	April	none	0		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center). Appendix A-2 indicates tank AW-105 received 57 kgal of saltwell liquor in April 1985.
	May	244-BX	77,275	Transferred saltwell liquid and water flush from tank 244-BX to tank 241-AW-105.	Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center). Appendix A-2 indicates tank AW-105 received 52 kgal of saltwell liquor in May 1985.

Table A-1. Tank 241-AW-105 Waste Transfers July 1980 through September 1985

Year	Month	Source	Volume (gallons)	Comments	References
	May		-403,150	Transferred 403,150-gallons of supernatant waste from tank 241-AW-105 to tank 241-AW-102	Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center).
	June	none	0		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	July	PUREX E-5	102,300		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center). Appendix A-2 indicates tank AW-105 received 21 kgal of saltwell liquor in July 1985.
	August	PUREX E-5	187,603		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)
	September	PUREX E-5	95,700		Monthly Waste Generations Actuals - FY 1985 (Tank Farm Information Center)

A3.0 REFERENCES

65950-83-998PM, 1983, "Process Memo Transfer from AW103 to AW105," (letter from N. L. Pontious to Distribution, no date), Rockwell Hanford Operations, Richland, Washington. (RMIS-TFIC Accession #D196216796)

RHO, 1982, *Generated Waste & Evaporators from 1/01/1981 thru 11/01/1982*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D196193700)

RHO-MA-116, 1982, *PUREX Technical Manual*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-005, 1982, Dilute Complexed Waste Concentration, 242-A Evaporator-Crystallizer Campaign 80-9, August 13 to August 30, 1980, Rockwell Hanford Operations, Richland Washington.

RHO-SD-RE-OTR-009, 1983, *Operability Test Results (OTR) for Project B-281 Equipment, PUREX to 241-AW Tank Farm Process Lines and Jumpers*, Rockwell Hanford Operations, Richland, Washington. (RMIS Accession # 293-007897)

RHO-SD-WM-PE-017, 1984, *242-A Evaporator / Crystallizer FY 1984 Campaign Run 84-4 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RHO-SD-WM-PE-018, 1984, *242-A Evaporator / Crystallizer FY 1985 Campaign Run 84-3 Post Run Document*, Rockwell Hanford Operations, Richland, Washington.

RPT-040184, 1984, *Daily Operating Report 200 East Tank Farms Day Shift*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024363)

RPT-050184, 1984, *Daily Operating Report 200 East Tank Farms Day Shift*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024342)

RPT-060184, 1984, *Daily Operating Report Tank Farm Processing Operation*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024341)

RPT-070184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024321)

RPT-080184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024320)

RPT-090184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024319)

RPT-100184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024318)

RPT-110184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024243)

RPT-120184, 1984, *Daily Operating Report Tank Farm Processing Operations*, Rockwell Hanford Operations, Richland, Washington. (RMIS TFIC Accession # D195024197)

Appendix A-2

Tank 241-AW-105 Waste Transfer Records

January 1985 through August 2004

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	PD	PUREX NCRW Sludge (TRU)	PDNSG	Non-TRU Decladding Sludge From PUREX	241-AW-105	Tank	1/1/1985 0:00	1/31/1985 0:00	83	94	11	819
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	1/1/1985 0:00	1/31/1985 0:00	662	696	34	804
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	1/1/1985 0:00	1/31/1985 0:00	696	700	4	808
gain	DN	Dilute Non-Complexed	SWLIQ	Dilute, Non-Complexed Waste from All Single-Shell Tanks	241-AW-105	Tank	4/1/1985 0:00	4/30/1985 0:00	700	757	57	876
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	5/1/1985 0:00	5/1/1985 0:00	757	152	-605	271
gain	DN	Dilute Non-Complexed	SWLIQ	Dilute, Non-Complexed Waste from All Single-Shell Tanks	241-AW-105	Tank	5/2/1985 0:00	5/30/1985 0:00	152	204	52	323
gain	PD	PUREX NCRW Sludge (TRU)	PDSLG	PUREX Decladding Sludge	241-AW-105	Tank	7/1/1985 0:00	7/31/1985 0:00	94	104	10	333
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	7/1/1985 0:00	7/31/1985 0:00	230	311	81	440

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	SWLIQ	Dilute, Non-Complexed Waste from All Single-Shell Tanks	241-AW-105	Tank	7/1/1985 0:00	7/31/1985 0:00	209	230	21	359
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	7/1/1985 0:00	7/31/1985 0:00	204	209	5	338
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	7/1/1985 0:00	7/31/1985 0:00	311	323	12	452
gain	PD	PUREX NCRW Sludge (TRU)	PDSLG	PUREX Decladding Sludge	241-AW-105	Tank	8/1/1985 0:00	8/31/1985 0:00	104	122	18	470
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	8/1/1985 0:00	8/31/1985 0:00	323	503	180	650
gain	PD	PUREX NCRW Sludge (TRU)	PDSLG	PUREX Decladding Sludge	241-AW-105	Tank	9/1/1985 0:00	9/30/1985 0:00	122	138	16	666
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	9/1/1985 0:00	9/30/1985 0:00	503	573	70	736
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	9/1/1985 0:00	9/30/1985 0:00	573	588	15	751
gain	PD	PUREX NCRW Sludge (TRU)	PDSLG	PUREX Decladding Sludge	241-AW-105	Tank	10/1/1985 0:00	10/30/1985 0:00	138	157	19	770

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	10/1/1985 0:00	10/30/1985 0:00	607	685	78	867
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	10/1/1985 0:00	10/30/1985 0:00	588	607	19	789
gain	PD	PUREX NCRW Sludge (TRU)	PDSLG	PUREX Decladding Sludge	241-AW-105	Tank	11/1/1985 0:00	11/30/1985 0:00	157	183	26	1037
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	11/1/1985 0:00	11/30/1985 0:00	685	829	144	1011
gain	DN	Dilute Non-Complexed	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-105	Tank	12/1/1985 0:00	12/1/1985 0:00	835	876	41	1095
gain	PD	PUREX NCRW Sludge (TRU)	PDSLG	PUREX Decladding Sludge	241-AW-105	Tank	12/1/1985 0:00	12/1/1985 0:00	183	194	11	1054
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	12/1/1985 0:00	12/1/1985 0:00	829	835	6	1043
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	12/15/1985 0:00	12/15/1985 0:00	876	392	-484	611
gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX	241-AW-105	Tank	3/15/1986 0:00	3/30/1986 0:00	194	208	14	625

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Decladding Waste, FY 1986 Only								
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	3/15/1986 0:00	3/30/1986 0:00	392	478	86	711
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	3/15/1986 0:00	3/30/1986 0:00	478	499	21	732
gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-105	Tank	4/15/1986 0:00	4/30/1986 0:00	208	227	19	770
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	4/15/1986 0:00	4/30/1986 0:00	518	651	133	903
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	4/15/1986 0:00	4/30/1986 0:00	499	518	19	751
gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-105	Tank	5/15/1986 0:00	5/30/1986 0:00	227	240	13	545

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	5/15/1986 0:00	5/30/1986 0:00	280	358	78	623
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	5/15/1986 0:00	5/30/1986 0:00	261	280	19	532
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	5/15/1986 0:00	5/20/1986 0:00	651	261	-390	513
evaporation	PD	PUREX NCRW Sludge (TRU)	DN100	Evaporation	241-AW-105	Tank	6/1/1986 0:00	6/30/1986 0:00	240	208	-32	591
evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-105	Tank	6/1/1986 0:00	6/30/1986 0:00	358	390	32	623
gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-105	Tank	7/1/1986 0:00	7/1/1986 0:00	208	209	1	624
gain	PD	PUREX NCRW Sludge (TRU)	PDCSS	Dilute Non-Complexed PUREX Decladding Waste, FY 1986 Only	241-AW-105	Tank	8/1/1986 0:00	8/30/1986 0:00	209	216	7	685
gain	DN	Dilute Non-Complexed	PDSUP	Dilute, Non-Complexed Waste PUREX Decladding Waste	241-AW-105	Tank	8/1/1986 0:00	8/30/1986 0:00	400	444	44	678
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous	241-AW-105	Tank	8/1/1986 0:00	8/30/1986 0:00	390	400	10	634

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Sources								
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	9/1/1986 0:00	9/30/1986 0:00	444	441	-3	682
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	1/1/1987 0:00	1/31/1987 0:00	441	466	25	707
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	1/1/1987 0:00	1/31/1987 0:00	216	224	8	721
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	1/1/1987 0:00	1/31/1987 0:00	466	472	6	713
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	2/1/1987 0:00	2/28/1987 0:00	473	478	5	727
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	2/1/1987 0:00	2/28/1987 0:00	224	226	2	729
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	2/1/1987 0:00	2/28/1987 0:00	472	473	1	722
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	3/1/1987 0:00	3/31/1987 0:00	478	504	26	755
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	3/1/1987 0:00	3/31/1987 0:00	226	234	8	763

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	3/1/1987 0:00	3/31/1987 0:00	504	511	7	770
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	4/1/1987 0:00	4/30/1987 0:00	515	529	14	788
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	4/1/1987 0:00	4/30/1987 0:00	234	238	4	792
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	4/1/1987 0:00	4/30/1987 0:00	511	515	4	774
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	5/1/1987 0:00	5/30/1987 0:00	543	563	20	831
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	5/1/1987 0:00	5/30/1987 0:00	238	243	5	797
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	5/1/1987 0:00	5/30/1987 0:00	529	543	14	811
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	6/1/1987 0:00	6/30/1987 0:00	566	580	14	853
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	6/1/1987 0:00	6/30/1987 0:00	243	248	5	836
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	6/1/1987 0:00	6/30/1987 0:00	563	566	3	839
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	7/1/1987 0:00	7/30/1987 0:00	592	639	47	912

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	7/1/1987 0:00	7/30/1987 0:00	248	263	15	927
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	7/1/1987 0:00	7/30/1987 0:00	580	592	12	865
evaporation	PD	PUREX NCRW Sludge (TRU)	DN100	Evaporation	241-AW-105	Tank	8/2/1987 0:00	8/2/1987 0:00	263	241	-22	905
evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-105	Tank	8/2/1987 0:00	8/2/1987 0:00	639	661	22	927
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	8/15/1987 0:00	8/15/1987 0:00	661	28	-633	294
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	9/1/1987 0:00	9/30/1987 0:00	28	89	61	355
transfer	DN	Dilute Non-Complexed	241-AW-102	Tank	241-AW-105	Tank	9/1/1987 0:00	9/5/1987 0:00	89	702	613	968
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	10/1/1987 0:00	10/30/1987 0:00	702	724	22	990
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	2/1/1988 0:00	2/15/1988 0:00	724	722	-2	988
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	2/15/1988 0:00	2/15/1988 0:00	722	650	-72	916
gain	PD	PUREX NCRW Sludge (TRU)	CX70	Dilute, Complexed (mixture) Hot-Semiworks TRU	241-AW-105	Tank	3/1/1988 0:00	3/30/1988 0:00	241	267	26	946

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Solids								
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	3/1/1988 0:00	3/30/1988 0:00	650	654	4	920
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	3/15/1988 0:00	3/30/1988 0:00	654	426	-228	718
gain	PD	PUREX NCRW Sludge (TRU)	CX70	Dilute, Complexed (mixture) Hot-Semiworks TRU Solids	241-AW-105	Tank	4/1/1988 0:00	4/30/1988 0:00	267	315	48	781
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	4/1/1988 0:00	4/1/1988 0:00	426	441	15	733
ransfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AW-102	Tank	4/15/1988 0:00	4/15/1988 0:00	441	166	-275	506
gain	PD	PUREX NCRW Sludge (TRU)	CX70	Dilute, Complexed (mixture) Hot-Semiworks TRU Solids	241-AW-105	Tank	5/1/1988 0:00	5/30/1988 0:00	315	322	7	513
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	5/1/1988 0:00	5/30/1988 0:00	166	178	12	528
ain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	5/1/1988 0:00	5/30/1988 0:00	322	325	3	516
ain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	5/1/1988 0:00	5/1/1988 0:00	178	192	14	542

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	PD	PUREX NCRW Sludge (TRU)	CX70	Dilute, Complexed (mixture) Hot-Semiworks TRU Solids	241-AW-105	Tank	6/1/1988 0:00	6/30/1988 0:00	327	329	2	546
gain	DN	Dilute Non-Complexed	PDL87	PUREX Decladding Supernate, 1987	241-AW-105	Tank	6/1/1988 0:00	6/30/1988 0:00	199	213	14	567
gain	PD	PUREX NCRW Sludge (TRU)	PDS87	PUREX Decladding Sludge	241-AW-105	Tank	6/1/1988 0:00	6/30/1988 0:00	325	327	2	544
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	6/1/1988 0:00	6/30/1988 0:00	192	199	7	553
gain	PD	PUREX NCRW Sludge (TRU)	CX70	Dilute, Complexed (mixture) Hot-Semiworks TRU Solids	241-AW-105	Tank	7/1/1988 0:00	7/30/1988 0:00	329	331	2	569
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	7/1/1988 0:00	7/30/1988 0:00	213	233	20	589
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	8/1/1988 0:00	8/30/1988 0:00	233	238	5	594
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	9/1/1988 0:00	9/30/1988 0:00	254	313	59	669
gain	PD	PUREX NCRW Sludge (TRU)	PMS89	PUREX Spent Metathesis Solids After FY89	241-AW-105	Tank	9/1/1988 0:00	9/30/1988 0:00	331	341	10	679
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous	241-AW-105	Tank	9/1/1988 0:00	9/30/1988 0:00	238	254	16	610

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Sources								
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	10/1/1988 0:00	10/30/1988 0:00	313	354	41	720
gain	PD	PUREX NCRW Sludge (TRU)	PMS89	PUREX Spent Metathesis Solids After FY89	241-AW-105	Tank	10/1/1988 0:00	10/30/1988 0:00	341	348	7	740
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	10/1/1988 0:00	10/30/1988 0:00	354	367	13	733
ain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	11/1/1988 0:00	11/30/1988 0:00	367	415	48	788
ain	PD	PUREX NCRW Sludge (TRU)	PMS89	PUREX Spent Metathesis Solids After FY89	241-AW-105	Tank	11/1/1988 0:00	11/30/1988 0:00	348	356	8	796
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	11/1/1988 0:00	11/30/1988 0:00	415	425	10	806
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	12/1/1988 0:00	12/30/1988 0:00	429	447	18	828
gain	PD	PUREX NCRW Sludge (TRU)	PMS89	PUREX Spent Metathesis Solids After FY89	241-AW-105	Tank	12/1/1988 0:00	12/30/1988 0:00	356	359	3	831
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	12/1/1988 0:00	12/30/1988 0:00	425	429	4	810
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface	4/1/1989 0:00	4/30/1989 0:00	447	444	-3	828

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
a						Change, Instrument, etc.)						
oss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	5/1/1989 0:00	5/30/1989 0:00	444	441	-3	825
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-105	Tank	6/1/1989 0:00	6/30/1989 0:00	441	444	3	828
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	7/1/1989 0:00	7/30/1989 0:00	444	445	1	833
gain	PD	PUREX NCRW Sludge (TRU)	PMS89	PUREX Spent Metathesis Solids After FY89	241-AW-105	Tank	7/1/1989 0:00	7/30/1989 0:00	359	363	4	832
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-105	Tank	11/1/1989 0:00	11/30/1989 0:00	445	448	3	836
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	12/1/1989 0:00	12/30/1989 0:00	448	490	42	878
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	12/1/1989 0:00	12/30/1989 0:00	490	495	5	883
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	1/1/1990 0:00	1/30/1990 0:00	495	500	5	888

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	PML89	PUREX Spent Metathesis Liquid After FY89	241-AW-105	Tank	2/2/1990 0:00	2/28/1990 0:00	500	509	9	897
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	2/2/1990 0:00	2/28/1990 0:00	509	517	8	905
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	4/1/1990 0:00	4/30/1990 0:00	517	514	-3	902
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	6/1/1990 0:00	6/30/1990 0:00	514	511	-3	899
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-105	Tank	7/1/1990 0:00	7/30/1990 0:00	511	517	6	905
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	9/1/1990 0:00	9/30/1990 0:00	517	514	-3	902
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-105	Tank	10/1/1990 0:00	10/31/1990 0:00	514	517	3	905

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	12/1/1990 0:00	12/31/1990 0:00	517	514	-3	902
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-105	Tank	8/1/1991 0:00	8/31/1991 0:00	514	517	3	905
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	9/1/1991 0:00	9/30/1991 0:00	517	514	-3	902
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	1/1/1992 0:00	1/31/1992 0:00	514	513	-1	901
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	3/1/1992 0:00	3/31/1992 0:00	513	511	-2	899
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change,	241-AW-105	Tank	4/1/1992 0:00	4/30/1992 0:00	511	512	1	900

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Instrument, Etc.								
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	7/29/1992 0:00	7/29/1992 0:00	512	518	6	906
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	8/26/1992 0:00	8/26/1992 0:00	518	523	5	911
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	9/10/1992 0:00	9/30/1992 0:00	523	547	24	935
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	10/29/1992 0:00	10/30/1992 0:00	547	552	5	940
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	11/14/1992 0:00	11/14/1992 0:00	552	557	5	945

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	12/11/1992 0:00	12/30/1992 0:00	557	570	13	958
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	1/16/1993 0:00	1/16/1993 0:00	570	575	5	963
·ain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	2/1/1993 0:00	2/27/1993 0:00	575	589	14	977
ain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	3/6/1993 0:00	3/18/1993 0:00	589	598	9	986
oss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	4/1/1993 0:00	4/30/1993 0:00	598	595	-3	983

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	5/1/1993 0:00	5/31/1993 0:00	595	593	-2	981
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	5/10/1993 0:00	5/21/1993 0:00	593	606	13	994
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	6/1/1993 0:00	6/30/1993 0:00	606	605	-1	993
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	6/28/1993 0:00	6/28/1993 0:00	605	610	5	998
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	7/31/1993 0:00	7/31/1993 0:00	610	614	4	1002

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	UNKN	Gain Due To Gas, Surface Change, Instrument, Etc.	241-AW-105	Tank	10/1/1993 0:00	10/31/1993 0:00	614	615	1	1003
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	10/20/1993 0:00	10/20/1993 0:00	615	622	7	1010
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	10/28/1993 0:00	10/28/1993 0:00	622	627	5	1015
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	11/2/1993 0:00	11/18/1993 0:00	627	649	22	1037
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	12/8/1993 0:00	12/8/1993 0:00	649	656	7	1044
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	INST	Loss due to Change of Instruments	3/31/1994 0:00	3/31/1994 0:00	656	652	-4	1040
gain	DN	Dilute Non-Complexed	INST	Change In Tank Level Due To Change In	241-AW-105	Tank	4/30/1994 0:00	4/30/1994 0:00	652	655	3	1043

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Instrumentation								
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	6/17/1994 0:00	6/17/1994 0:00	655	660	5	1048
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	8/21/1994 0:00	8/25/1994 0:00	660	669	9	1057
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	9/1/1994 0:00	9/20/1994 0:00	669	687	18	1075
evaporation	PD	PUREX NCRW Sludge (TRU)	DN100	Evaporation	241-AW-105	Tank	11/1/1994 0:00	11/1/1994 0:00	363	261	-102	973
evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-105	Tank	11/1/1994 0:00	11/1/1994 0:00	687	789	102	1075
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	11/11/1994 0:00	11/19/1994 0:00	791	807	16	1093
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous	241-AW-105	Tank	11/11/1994 0:00	11/19/1994 0:00	789	791	2	1077

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Sources								
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AP-108	Tank	11/25/1994 0:00	11/30/1994 0:00	807	327	-480	613
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	12/1/1994 0:00	12/31/1994 0:00	327	325	-2	611
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AP-108	Tank	12/1/1994 0:00	12/3/1994 0:00	325	41	-284	327
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	12/5/1994 0:00	12/23/1994 0:00	41	56	15	342
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	1/6/1995 0:00	1/31/1995 0:00	58	75	17	361
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	1/6/1995 0:00	1/31/1995 0:00	56	58	2	344
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr	241-AW-105	Tank	2/3/1995 0:00	2/28/1995 0:00	75	97	22	383

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Fuel)								
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	2/3/1995 0:00	2/28/1995 0:00	97	100	3	386
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	3/3/1995 0:00	3/25/1995 0:00	100	124	24	410
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	3/3/1995 0:00	3/25/1995 0:00	124	127	3	413
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	4/5/1995 0:00	4/25/1995 0:00	127	136	9	422
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	4/5/1995 0:00	4/25/1995 0:00	136	138	2	424
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	5/1/1995 0:00	5/31/1995 0:00	138	184	46	470
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	5/1/1995 0:00	5/31/1995 0:00	184	187	3	473

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	6/1/1995 0:00	6/30/1995 0:00	187	186	-1	472
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	6/7/1995 0:00	6/28/1995 0:00	186	286	100	572
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	6/7/1995 0:00	6/28/1995 0:00	286	288	2	574
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	7/1/1995 0:00	7/31/1995 0:00	288	287	-1	573
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	7/12/1995 0:00	7/29/1995 0:00	289	308	19	594
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	7/12/1995 0:00	7/29/1995 0:00	287	289	2	575

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
'oss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	8/1/1995 0:00	8/31/1995 0:00	308	307	-1	593
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	8/16/1995 0:00	8/16/1995 0:00	307	311	4	597
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	9/13/1995 0:00	9/21/1995 0:00	312	325	13	611
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	9/13/1995 0:00	9/21/1995 0:00	311	312	1	598
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	10/1/1995 0:00	10/31/1995 0:00	325	324	-1	610
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc.	241-AW-105	Tank	10/16/1995 0:00	10/26/1995 0:00	325	336	11	622

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
				Streams (npr Fuel)								
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	10/16/1995 0:00	10/26/1995 0:00	324	325	1	611
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	11/1/1995 0:00	11/30/1995 0:00	336	333	-3	619
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	11/7/1995 0:00	11/22/1995 0:00	333	387	54	673
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	11/7/1995 0:00	11/22/1995 0:00	387	389	2	675
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	11/11/1995 0:00	11/11/1995 0:00	389	390	1	676
transfer	DN	Dilute Non-Complexed	241-AW-105	Tank	241-AP-104	Tank	11/13/1995 0:00	11/15/1995 0:00	390	60	-330	346
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument,	12/1/1995 0:00	12/31/1995 0:00	60	59	-1	345

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
						etc.)						
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	12/8/1995 0:00	12/28/1995 0:00	59	87	28	373
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	1/5/1996 0:00	1/30/1996 0:00	87	106	19	392
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	2/6/1996 0:00	2/27/1996 0:00	106	125	19	411
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	3/6/1996 0:00	3/27/1996 0:00	126	138	12	424
gain	DN	Dilute Non-Complexed	WATER	Flush Water From Miscellaneous Sources	241-AW-105	Tank	3/6/1996 0:00	3/27/1996 0:00	125	126	1	412

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	5/16/1996 0:00	5/16/1996 0:00	138	140	2	426
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	5/22/1996 0:00	5/22/1996 0:00	140	145	5	431
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	6/1/1996 0:00	6/30/1996 0:00	145	144	-1	430
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	6/19/1996 0:00	6/19/1996 0:00	144	149	5	435
gain	DN	Dilute Non-Complexed	PXMSC	Dilute, Non-Complexed Waste From PUREX Misc. Streams (npr Fuel)	241-AW-105	Tank	6/30/1996 0:00	6/30/1996 0:00	149	154	5	440

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	11/1/1996 0:00	11/30/1996 0:00	154	153	-1	439
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	2/1/1997 0:00	2/28/1997 0:00	153	152	-1	438
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	9/1/1997 0:00	9/30/1997 0:00	152	151	-1	437
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	11/1/1997 0:00	11/30/1997 0:00	151	150	-1	436
evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-105	Tank	3/1/1998 0:00	3/1/1998 0:00	150	156	6	436
evaporation	PD	PUREX NCRW Sludge (TRU)	DN100	Evaporation	241-AW-105	Tank	3/1/1998 0:00	3/1/1998 0:00	261	255	-6	430

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	INST	Loss due to Change of Instruments	4/15/1998 0:00	4/15/1998 0:00	156	154	-2	434
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	10/1/1998 0:00	10/31/1998 0:00	154	153	-1	433
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	12/1/1998 0:00	12/31/1998 0:00	153	152	-1	432
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	1/1/1999 0:00	1/31/1999 0:00	152	151	-1	431
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	3/1/1999 0:00	3/31/1999 0:00	151	150	-1	430

Table A-2. Tank 241-AW-105 Transfers January 1985 through December 2000

Transaction Type	Waste Type	Waste Type Description	Source	Source Description	Destination	Destination Description	Transfer Begin Date	Transfer End Date	Waste Type Start Volume kgal	Waste Type End Volume kgal	Transfer Volume kgal	Tank Volume kgal
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	9/1/1999 0:00	9/30/1999 0:00	150	149	-1	429
evaporation	SL	DSS/SST solids Sludge	DN100	Evaporation	241-AW-105	Tank	10/1/1999 0:00	10/1/1999 0:00	25	0	-25	404
evaporation	DN	Dilute Non-Complexed	DN100	Evaporation	241-AW-105	Tank	10/1/1999 0:00	10/1/1999 0:00	149	174	25	429
evaporation	SL	DSS/SST solids Sludge	SL100	Evaporation	241-AW-105	Tank	10/1/1999 0:00	10/1/1999 0:00	0	255	255	429
evaporation	PD	PUREX NCRW Sludge (TRU)	SL100	Evaporation	241-AW-105	Tank	10/1/1999 0:00	10/1/1999 0:00	255	0	-255	174
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	12/1/1999 0:00	12/31/1999 0:00	174	173	-1	428
loss	DN	Dilute Non-Complexed	241-AW-105	Tank	UNKN	Loss due to (Burp, Lance Evaporation, Surface Change, Instrument, etc.)	2/1/2000 0:00	2/29/2000 0:00	173	172	-1	427

Table A-3. Tank 241-AW-105 Transfers January 2001 through August 2004

Event Type	Waste Phase	Waste Designation	Waste Designation Description	Source	Destination	Reason	Start Date	End Date	Previous Waste Type Volume kgal	New Waste Type Volume kgal	Transfer Volume kgal	Tank Total Volume kgal	Comment
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	General Variance (+/-)	2/1/2001 0:00	2/28/2001 0:00	172	171	-1	426	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	General Variance (+/-)	2/1/2001 0:00	2/28/2001 0:00	255	255	0	426	
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	Rebaseline	1/1/2001 0:00	1/1/2001 0:00	0	172	172	427	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	Rebaseline	1/1/2001 0:00	1/1/2001 0:00	0	255	255	427	
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	General Variance (+/-)	1/1/2002 0:00	1/31/2002 0:00	171	170	-1	425	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	General Variance (+/-)	1/1/2002 0:00	1/31/2002 0:00	255	255	0	425	
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	Analysis (+/-)	3/1/2002 0:00	3/1/2002 0:00	170	162	-8	425	Sludge volume 255 Kgal to 263 Kgal per BBI review.
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	Analysis (+/-)	3/1/2002 0:00	3/1/2002 0:00	255	263	8	425	Sludge volume 255 Kgal to 263 Kgal per BBI review.
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	General Variance (+/-)	5/1/2002 0:00	5/30/2002 0:00	162	161	-1	424	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	General Variance (+/-)	5/1/2002 0:00	5/30/2002 0:00	263	263	0	424	
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	General Variance (+/-)	1/31/2003 0:00	1/31/2003 0:00	161	160	-1	423	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	General Variance (+/-)	1/31/2003 0:00	1/31/2003 0:00	263	263	0	423	
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	General Variance (+/-)	2/1/2003 0:00	2/28/2003 0:00	160	159	-1	422	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	General Variance (+/-)	2/1/2003 0:00	2/28/2003 0:00	263	263	0	422	
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	General Variance (+/-)	12/1/2003 0:00	12/31/2003 0:00	263	263	0	421	

Table A-3. Tank 241-AW-105 Transfers January 2001 through August 2004

Event Type	Waste Phase	Waste Designation	Waste Designation Description	Source	Destination	Reason	Start Date	End Date	Previous Waste Type Volume kgal	New Waste Type Volume kgal	Transfer Volume kgal	Tank Total Volume kgal	Comment
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	General Variance (+/-)	12/1/2003 0:00	12/31/2003 0:00	159	158	-1	421	
ADJ	Supernatant	DN	Super (DN) (Dilute Non-Complexed)	ADJ	241-AW-105	Analysis (+/-)	4/1/2004 0:00	4/1/2004 0:00	158	158	0	421	BBI FY04 Q3 Update, DN not changed to 157 because of rounding
ADJ	Sludge	SL	Sludge Solid	ADJ	241-AW-105	Analysis (+/-)	4/1/2004 0:00	4/1/2004 0:00	263	190	-73	421	BBI FY04 Q3 Update, DN not changed to 157 because of rounding
ADJ	Sludge	IS	Sludge Interstitial (IS)	ADJ	241-AW-105	Analysis (+/-)	4/1/2004 0:00	4/1/2004 0:00	0	73	73	421	BBI FY04 Q3 Update, DN not changed to 157 because of rounding

APPENDIX B

SURVEILLANCE ANALYSIS COMPUTER SYSTEM (SACS)

SURFACE LEVEL MEASUREMENTS FOR TANK 241-AW-105

B.1 SURFACE LEVEL MEASUREMENTS

From July 1980 to the present, the surface level of the waste stored in tank 241-AW-105 was either manually measured or measured with an automated instrument. The waste surface level measurements were recorded in the Surveillance Analysis Computer System (SACS). The SACS measurements of the waste surface level can be accessed through the Tank Waste Information Network System (TWINS) database at the following web addresses:

> http://twins.pnl.gov/data/getLookupFields3.exe?table=twins_catalog.dbo.lp_Retrieve_SACS_SL&whatsnew=Measurements

The surface level measurements for the waste stored in tank 241-AW-105 were downloaded from the TWINS database on August 19, 2004. The surface level measurements for the waste stored in tank 241-AW-105 are plotted in Appendix B for July 1980 through August 18, 2004. The waste transfer records in Appendices A are consistent with waste surface level measurements in Appendix B.

Figure B-1.

Tank 241-AW-105 Waste Surface Level July 1980 - June 1984

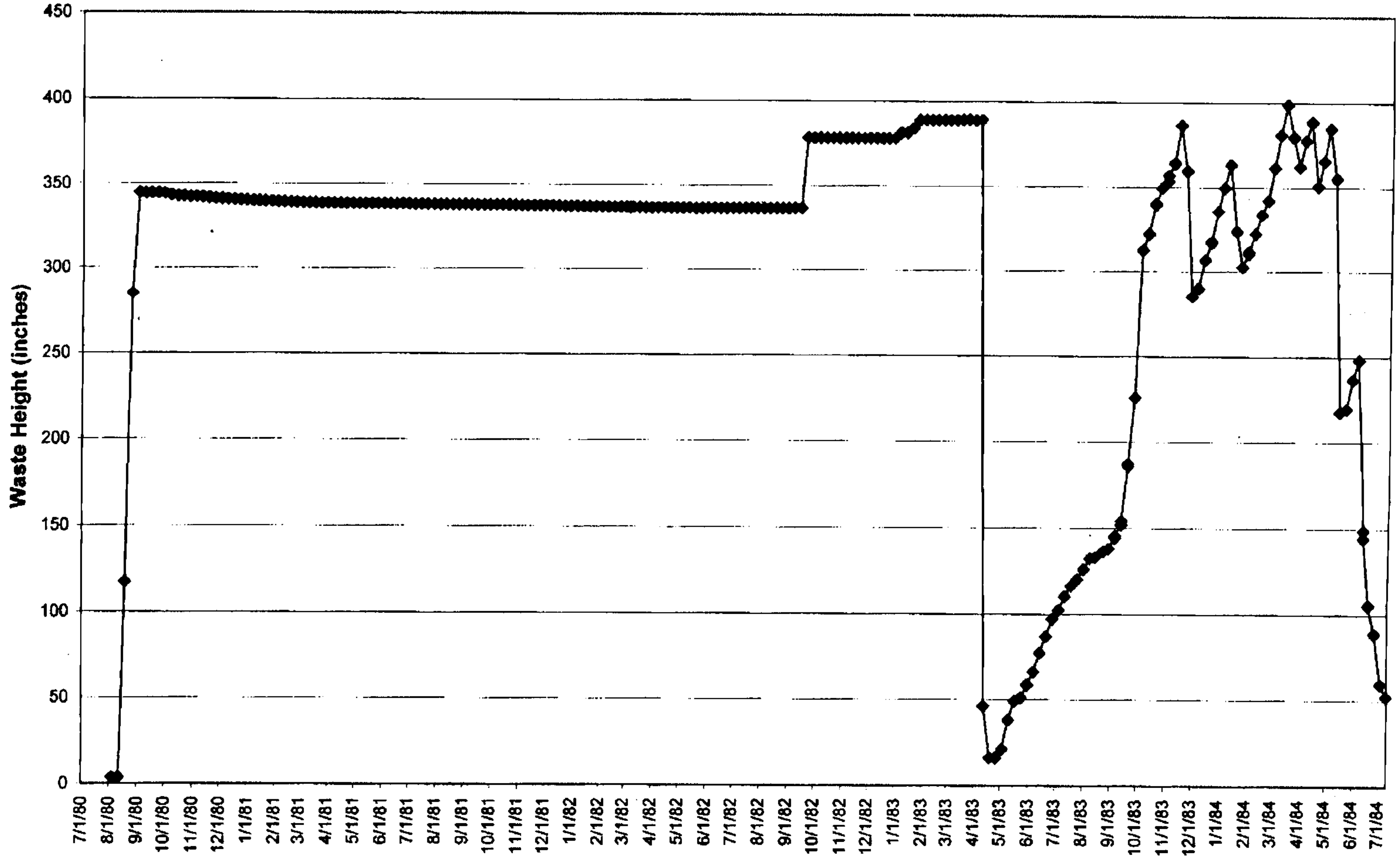


Figure B-2.

Tank 241-AW-105 Waste Surface Level July 1984 - December 1989

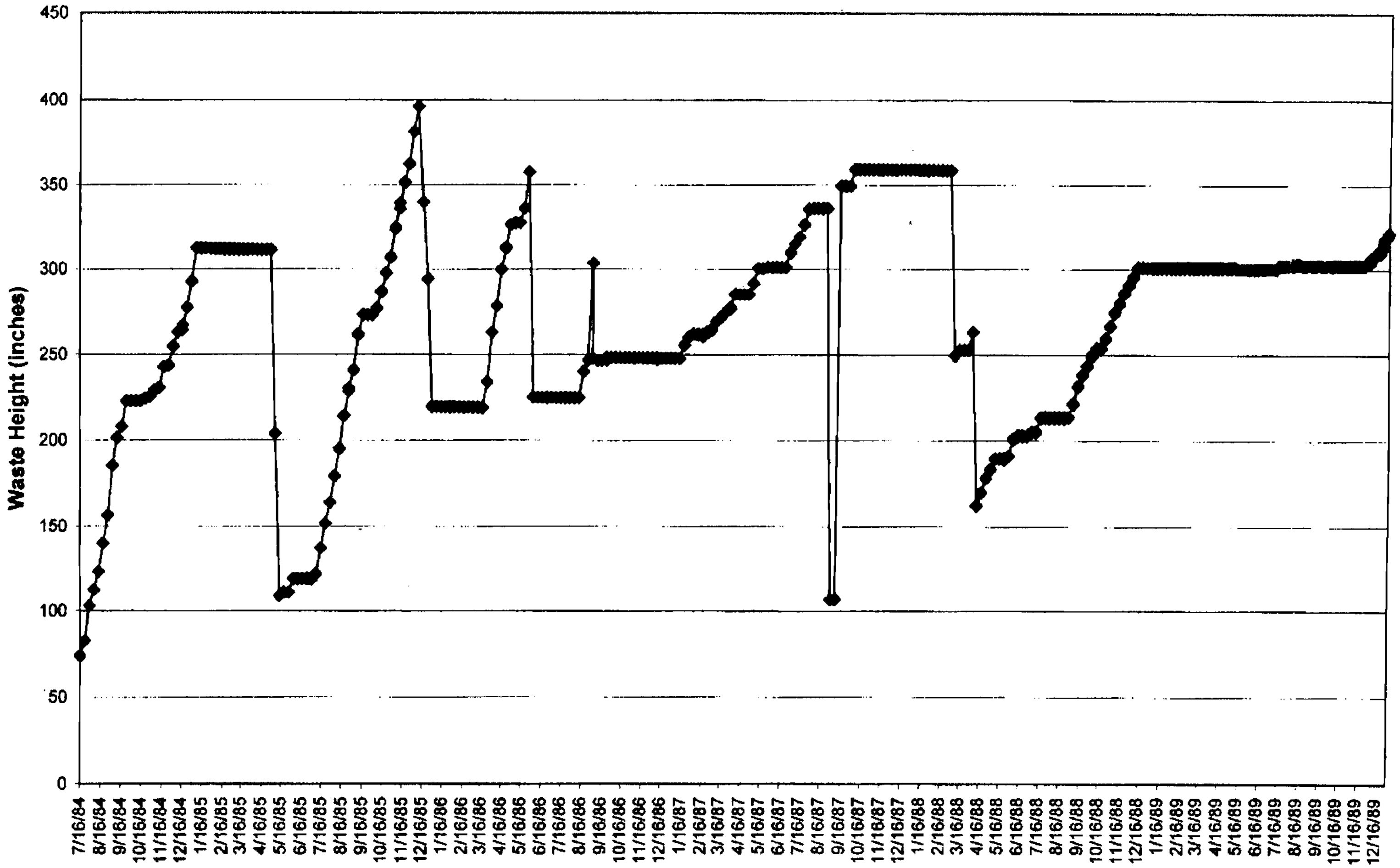


Figure B-3.

Tank 241-AW-105 Waste Surface Level January 1990 - December 1994

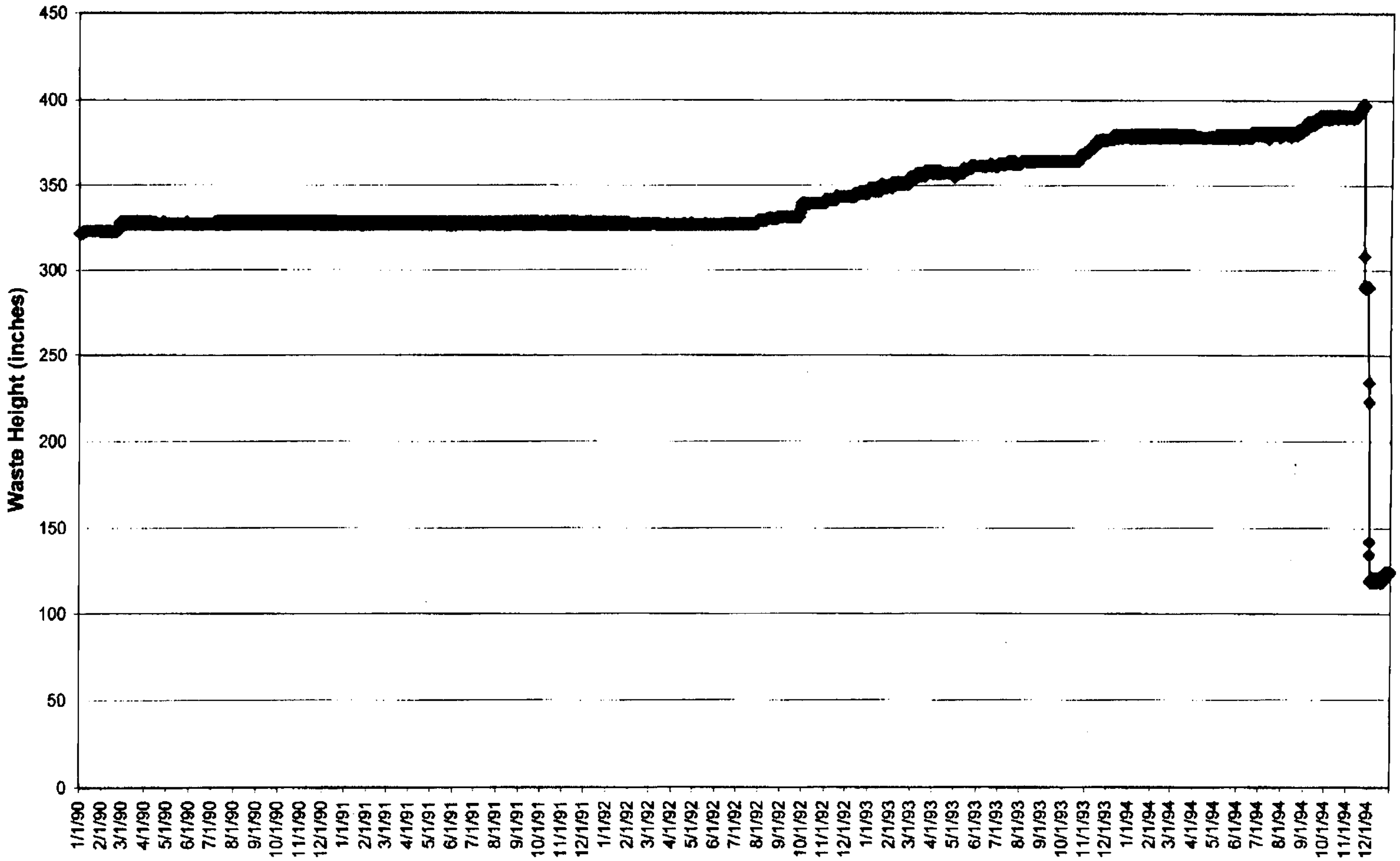


Figure B-4.

Tank 241-AW-105 Waste Surface Level January 1995 - August 2004